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WPI Journal

WORCESTER POLYTECHNIC INSTITUTE AUGUST 1983

PLACEBOS

Reunion '83 Revisited
WPI Women

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VOLUME 87, NUMBER 1 AUGUST 1983

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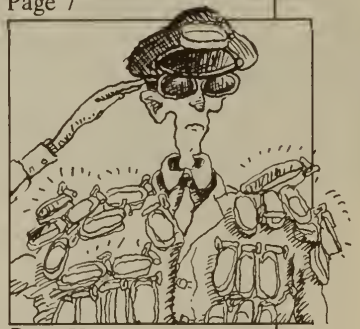
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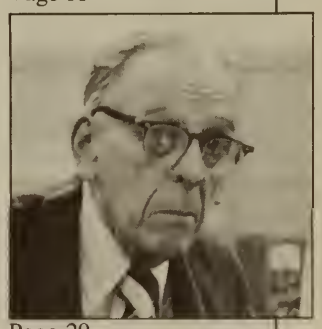
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NEWS FROM THE HILL

The Plan Gets Faculty Endorsement

Following extensive, point-by-point discussion over a year-long period, the WPI faculty has reaffirmed its commitment to the WPI Plan, the project- and competency-based undergraduate academic program instituted in 1970.

William R. Grogan, '46, Dean of Undergraduate Studies, says that the early May endorsement, coming after some 37 meetings of the Committee on Academic Policy (CAP) and several faculty and public forums, is especially meaningful. For of the current 185 voting professors, more than 120 joined the faculty after 1970, and a majority came as the result of growth of the college rather than through attrition.

Just as important, says Grogan, the reratified Plan incorporates essentially the same educational priorities put into effect in 1970, including the school's unique emphasis on the human side of technological education. Specifically, the Plan emphasizes two professional-level project and research activities, flexible curricula, concentrated study in the humanities, development of personal initiative and leadership skills, as well as extensive practice in written and oral communication. Finally, through a senior year competency examination, or "comp," the Plan tests students' ability in their major field of study.

According to Grogan, the comp has long been perhaps the most controversial thread of the overall fabric of the Plan. A number of faculty and students, he says, feel the comp has grown into "an excessively dominant force in the academic, professional and personal lives of many students." This concern, he says, led to long and passionate discussion in the past year's CAP and faculty meetings. In the final vote, however, proposals for replacements for the comp, such as an integrative senior seminar, were turned down, keeping the competency exam concept in place.

President Edmund T. Cranch (l.) and Robert F. Reeves, Vice President for Student Affairs, outline campus plan recommendations at Spring Alumni Council Meeting.

But Grogan sees the comp as an ongoing source of significant campus-wide concern, one which warrants a continual dialogue among faculty, students and administrators.

Similarly, a great deal of campus discussion has focused on the academic standards imposed by the Accreditation Board for Engineering and Technology (ABET), the key accrediting agency of U.S. engineering colleges. Specifically, a recent ABET study of the Plan voiced concern over the amount of work in the basic sciences required under the Plan for the bachelor's degree in the various fields of engineering. (ABET does not accredit science and mathematics programs.)

In responding to the ABET guidelines, the faculty approved broad area distribution requirements, not to exceed 10 of the 16 units of study possible in a four-year program. Each department may formulate its own specific unit and distribution requirements by areas, rather than by specific courses, subject to faculty approval.

For example, in chemical engineering the faculty has approved a minimum 10 units (including the project in the major field) as follows: 1⅓ in mathematics, 1⅓ in basic science, 5 in engineering science and design and 1⅓ in advanced chemistry.

In essence, then, the concepts underlying the Plan have merited the resounding approval of today's faculty, more than half of whom had not been part of the original discussions on this approach to scientific and engineering education. What's more, the mechanics of the program will remain intact, pending future ABET review as well as ongoing discussion among the WPI community. In Gro-

gan's view, this dialogue is a "healthy, essential element of the evolution and refinement of the WPI Plan."

Campus Blueprint Stresses Student Life

Recent capital projects at WPI—like the renovations of Atwater Kent Laboratories, Salisbury Labs and Washburn Building—have addressed the need to maintain and enhance the school's academic integrity. Now that these programs are completed or well under way, what's next?

Chief targets of capital projects in the near future, says a Boston architectural and planning firm, should be the several elements of campus life—residential, recreational and social space, as well as practical matters like parking and physical plant services.

Earlier this year, after an eight-month study of the WPI campus, including frequent consultation with administrative, faculty and student committees, Earl R. Flansburgh & Associates, Inc., presented a view of a revitalized campus—one that can more readily accommodate the needs of WPI's 3,500 students, as well as its faculty, staff and visitors.

According to Robert F. Reeves, Vice President for Student Affairs, who headed the WPI planning team, as WPI's enrollment has grown, campus housing has become increasingly inadequate. Today, there are on-campus accommodations for just 900, supplemented by fraternity housing for 500. Thus, there can be tremendous pressure on students to locate lodgings in apartments or houses near campus. Added to this, Reeves says, the national trend toward greater on-campus living makes future housing and dining facilities the school's primary capital improvement need.

Beyond lodging and dining accommodations, Flansburgh established the following possible responses to guide WPI's growth into the 1990s:

Upgrading of Morgan and Daniels Halls. Greater space for lounges, kitchenettes and study rooms; carpeting; better lighting; new, movable furniture.

Renovation and upgrading of athletic fields. Presently inadequate for the vastly increased demand for year-round recreation facilities and varsity, club and intramural sports. Improvements include reorganization of soccer and baseball fields; installation of an all-weather track and football field; better lighting; additional tennis courts.

New central services facility. Now fragmented in location, the various functions that maintain the physical plant should be consolidated near the nonresidential, nonacademic edge of campus.

New campus center. A major component of quality student life. Proposed is a new building, centrally located and containing student services, book store, mail office, snack bar, game rooms, etc., as well as much-needed conference and project rooms.

Second new dormitory.

New and relocated parking. To meet current demand and projected needs created by new dormitory and campus center.

Renovation of the Quadrangle. To complete the greening of the campus (a project that began a decade ago) and to reinstate the campus's original beauty.

While these proposals will receive further WPI analysis of their financial feasibility and compatibility with the long-term mission of the school, they are designed, says the Flansburgh report, to "maintain the desired, established relationship of campus life, while suggesting modifications that will enhance the institution and its learning experience."

WPI Takes Four More CASE Awards

Pictured at the construction site of the current Washburn Shops renovation are members of the WPI University Relations staff whose superior performance in the field of institutional advancement has won nationwide recognition through the Council for the Advancement and Support of Education (CASE). They are (from left to right): Deborah A. Scott, Assistant Alumni Director; Charlotte M. Wharton, Graphic Designer; Roger N. Perry, Director of Public Relations; Lois S. Murray, Director of Planned Giving; Sharon C. Davis, Managing Director of the Alumni Fund; Denise R. Rodino, Development Officer; and Stephen J. Hebert, Alumni Director. Absent from the photo is Thomas J. Denney, former Vice President for University Relations, who in June became Vice Chancellor for Development and Alumni Affairs at Washington University, St. Louis.

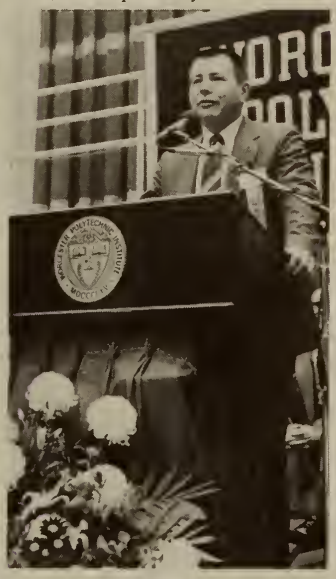
WPI was honored recently with CASE awards for exceptional achievement in the following areas: Improvement in Financial Support, Direct Mail for Financial Support, Matching Gift Programs, and Special Events, the latter a public exhibit for the Robert Goddard Centennial Celebration, entered jointly with Clark University. Our hats are off to these folks—and to our alumni, whose support of WPI programs continues to receive such highly acclaimed CASE recognition!

The Class of 1933's 50th Reunion Committee (above) consisted of (from left): Thomas E. Decker, John J. Dwyer, Edwin L. Johnson, Robert E. Ferguson, R. Norman Clark, Warren C. Saltmarsh, Allen L. Brownlee and George W. Lyman.

Pictured above are four 1983 alumni award recipients. In the front row (from left): Dr. George A. Cowan, '41, winner of the Robert H. Goddard Award for outstanding professional achievement, Alumni President Peter H. Horstmann, '55 and Goddard winner S. Bailey Norton, '43. Back row (from left): WPI President Edmund T. Cranch, Goddard winner Earl G. Page, '43 and Edwin C. Campbell, '43, winner of the Herbert F. Taylor Award for service to WPI. Dancing at right are Dr. Edward H. Peterson, '43 and his wife, Bev.

REUNION '83

The 1983 General Reunion Luncheon (left) at Harrington Auditorium. Dr. David S. Crimmins, '58 (below) announces his class's 25th-reunion gift of $147,291. The Classes of '43 and '33 made gifts of $67,496 and $104,939 respectively.



Two generations of service (left): Gregory W. Backstrom, '70, winner of the John Boynton Award for outstanding service by a young alumnus to WPI, and his dad, Carl, '30, past recipient of the Herbert F. Taylor award for distinguished service to WPI. Below: the 25th-reunion class of 1958. Right: outgoing Alumni Association President Peter H. Horstmann, '55 (center) and his wife, Barbara, receive thanks from his successor, Harry W. Tenney, Jr., '56.

If you were on the Hill in June for Reunion '83, you'll recall a weekend full of the events pictured here—get-togethers to renew friendships, tours and mini-courses to provide a close look at campus changes and directions for the next decade, moments to reflect on your years at WPI and times since.

Alumni families returned in record numbers; leadership of the Alumni Association passed from Pete Horstmann, '55, to Harry Tenney, Jr., '56; and the weather cooperated for all but Saturday morning.

Five members of the Class of 1958 (right) are (from left): Robert J. Boyea, Stanley W. Graveline, Peter Ottowitz, Robert S. Jenkins and Howard O. Painter, Jr. Far right: Accepting the Class of 1917 attendance trophy from Alumni Secretary-Treasurer Stephen J. Hebert, '66 (right) is George W. Lyman, '33. Fifty-three percent of his class attended reunion. Below: The 40th-reunion class of 1943.

At right is the 50th-reunion class of 1933. Below right are three members of the Class of 1938 (from left): Richard F. Burke, Jr., Albert J. Kullas and Leo J. Cronin. Below left: 1963's Class President, William C. Zinno (right), still can't figure out his Reunion Chairman's (Alfred A. Molinari, Jr.) Clambake act.

WPI Women: Different? Maybe. Making a Difference? Yes!

by Judith Nitsch, '75 CE

WPI women: Are we normal? Normal isn't the right word. Perhaps I should ask, are we different? Different from what? (or whom?) one then asks. Different from other women, and different from other engineers and scientists, I suppose.

Let's first look at some synonyms for normal: regular, analogical, ordinary, natural, usual, according to the rule.

How about different? Distinct, separate, other, nonidentical, not the same, unlike, dissimilar, various, diverse, contrary, variant, deviating, divergent, incompatible, discrepant, various, heterogeneous, perpendicular (perpendicular?!). Everyone I know would fit these descriptions, except maybe the last.

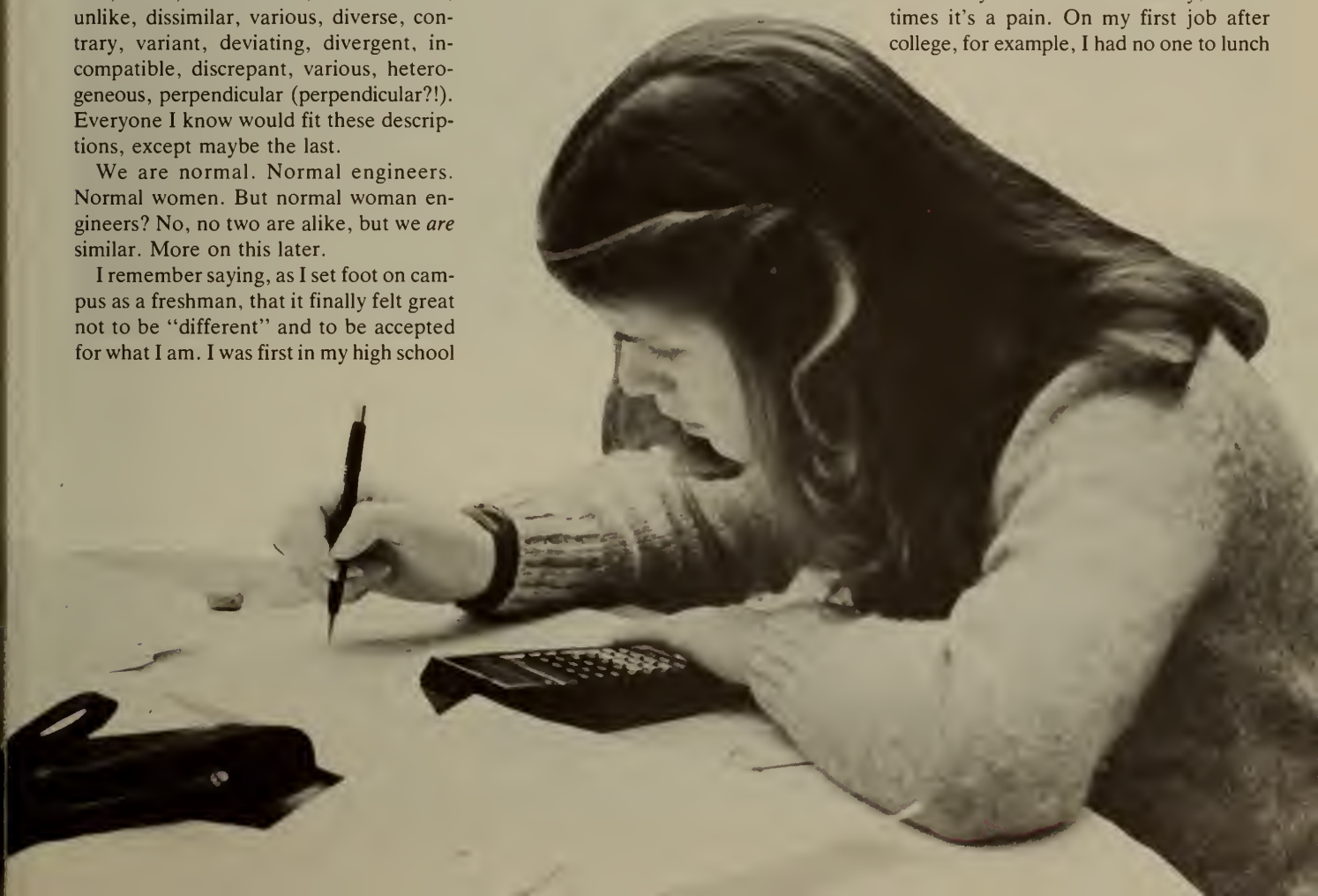
We are normal. Normal engineers. Normal women. But normal woman engineers? No, no two are alike, but we *are* similar. More on this later.

I remember saying, as I set foot on campus as a freshman, that it finally felt great not to be "different" and to be accepted for what I am. I was first in my high school class, and in high school the "smart" students were always outside the top cliques. This meant a lot then. I think I missed out on some of the fun and sometimes daring things my schoolmates did. Maybe I was too practical then. Anyway, at WPI I was like all the others in terms of academic achievement, and I made up for some of the lost time from high school. (As a freshman, my grades showed it, but I straightened out for the duration.)

As I contemplated writing on whether WPI women are different from anyone else, my initial reaction to this question was, "No, we're like everyone else." But I can't now say that with conviction.

Yes, we're certainly women, and, yes, we have engineering/scientific educations. We share many characteristics with other women and with other technical professionals. But unquestionably, we also have our differences. We are conspicuous by our small numbers in a traditionally male-dominated field. And our choice of career fields is what sets us distinctly apart from most other women.

Now this element of separateness—from our colleagues and other women—is not necessarily all bad. But frankly, sometimes it's a pain. On my first job after college, for example, I had no one to lunch



with. The surveyors and other engineers (all men) ate together, and management went out to lunch together, so I brown-bagged it and read at my desk.

A couple of years ago, at a Society of Women Engineers (SWE) conference, Betty Vetter, of the Scientific Manpower Commission, spoke on opportunities for women in science and engineering. She stated the case succinctly: "Women will continue to work for equal opportunity with men in their chosen fields. They will know they have reached that equality when they are given the same right to be mediocre and still advance that men have."

I can chuckle at such an idea, but I don't believe it is intended as a criticism of men. When women engineers are considered by their male counterparts as equal professionally, much of the pressure on women to never make mistakes will, like magic, vanish. But as long as women engineers remain the exception rather than the rule, the pressures and the differences between the sexes will continue. A chicken-and-egg issue, perhaps?

We employ a woman co-op student from Wentworth Institute of Technology at our office. Unquestionably, she is the exception to the stereotypical woman professional. She is very smart, as well as personable, down-to-earth, dedicated and a fun person to be around. Frankly, we would love to have a few more engineers like her in the company—women and men! She may make the grade steeper for future women engineers, however, because she is typecast as "typical" by the men in the office, yet by widespread standards she is the exceptional woman and the exemplary engineer.

According to John P. van Alstyne, Dean of Academic Advising at WPI, and a key figure in an informal support structure for women on campus, WPI women are becoming more "normal" with every class. Ten years ago, when the classes of 1973 to 1976 were on campus, the women in these classes were disproportionately grouped in the top third of their classes academically.) I should add that these classes included all the first women graduates of WPI except Leslie Small Zorabedian, '72, WPI's first female graduate. In the class of 1987, women will comprise fully 20 percent of an enrollment of more than 2,400.)

Today, women are spread more evenly throughout their classes on an academic basis. This makes life for women at WPI much more amicable because the academically average women do not experience such intense pressure to "keep up" with the other, more gifted or more ambitious women. What's more, male students do not seem to regard the women as "super-smart" but as similar to themselves academically. (Incidentally, Leslie had a 3.9

"I Wouldn't Want to be Hired Simply Because I'm a Woman"

Maureen Sexton, '83: she'll be helping people and computers get along better.

Before she can settle into a consulting post at Boston's Arthur Andersen & Company, the accounting firm, Maureen Sexton, '83 CS, has a few details to work out. As *Peddler* editor, she has to wrap up publication of this year's edition—no trivial task. Then she's off to the British Isles to search out her Irish heritage. Finally, later this summer, she'll begin at Andersen as a computer systems consultant.

Consulting, Maureen says, should allow her to experience a full range of problems and opportunities for applying computer technology. "And since I'll be helping organizations use the computer as a tool, I'll be right where I want to be—working at the interface of people and technology."

Affirmative action quotas, she believes, can give entry-level women an edge over the competition, "but they aren't a sure formula for success—for either the individual or the firm. I'd hate to think the job was mine for reasons other than my qualifications."

Beyond middle-level management, however, she feels that promotions for women are often harder to come by than for men with similar credentials. But the fact that so many women eventually leave the job force for their family may influence their firms' promotion practices, she concedes.

On campus, she believes the traditionally male-dominated fields like engineering may intimidate women students more than the sciences or mathematics. Still, she says, as more women become professionals, "all we really want is for our performance to open doors—as it does for men—rather than having doors opened for us because we are women."

Maureen, who grew up in East Hartford, has performed rather well at WPI. A member of the Skull, Tau Beta Pi and Upsilon Pi Epsilon, the computer science honor society, she points to the widening achievements of women at the Institute—president of the class of '83, feature editor of *Newspeak*, and president of Tau Beta Pi.

Not bad, you might say, for an engineering school which first admitted women only 15 years ago.

average and was first in her class at WPI.)

When I asked Dean van A if he thought WPI women were different, he replied, "Most definitely, because people won't let you be the same as others, and that scares me for a couple of reasons." First, a big problem women engineers face, he contends, is that they are playing a role that most people don't expect them to play, and thus it's very hard for others to regard them as normal—they are atypical of women. Second, he believes that people outside the professions still think women only get ahead by the "on-their-back" means or because they are a "brain" and therefore a social misfit. "They won't let women engineers be real people."

He goes on, "Women are the only 'human' engineers. They are often devoted to their company, but many also want to have a family and don't want to leave their children. It's these mixed feelings so many women seem to have trouble handling."

In 1971, he recalls, he spoke to a member of the 50-year reunion class who was concerned about two unmarried female electrical engineers in his firm. These women were first-rate engineers, the alumnus reported; they had an innate sense of responsibility to get the job done right, and they usually completed projects in a shorter amount of time than their male colleagues. At 5 p.m. each day the male engineers would go home to their families, but the women engineers would literally take their projects home. "They wanted to get it right," said the alumnus, who worried because he didn't think this situation was fair to these women.

At the April 1983 annual conference co-sponsored by the Boston Section SWE and the Association of Massachusetts Institute of Technology (MIT) Alumnae, Suzanne Peck of Honeywell, Inc., prefaced her remarks by asking the 260 women present to raise their hands if they were an only child or were first-born. An astonishing number of hands—at least 85 percent—shot up! Ms. Peck was not surprised. She said that we as women went into a "different" field because we were accustomed to responsibility. (In theory, the only child has no one with whom to share the chores, and the eldest of many families is "in charge" more often than not. We were encouraged to seek answers, a key element, it is argued, in discouraging the fear of making mistakes or of being different.)

Furthermore, we *expect* to be taken along. (The only child goes everywhere with her parents and is seldom left behind; when the only child becomes the elder or eldest, she is still the first to experiment with new activities and ideas, unless she wants to be outshone by her younger siblings.) In short, we don't shirk responsibility, and we expect to get it.

In discussing this concept with Paula Fragassi Delaney, '76 BB, we realized that most of our women classmates fitted this description, or else they were from a very large family. (Paula is the eldest of three daughters, and I am the second of seven.) I asked Paula if she thought WPI women differed greatly from other women engineers and scientists.

"Yes," she replied, "simply because the sum total of our educational experience is different from the traditional approach to education. We were learning with men, were taught by men and were trained to be problem solvers and team players. In our project work at WPI, we developed topics based on someone else's project, and our projects in turn led to someone else's. So we have more experience on a practical level. I really believe our education was different."

"Performance Is All That Should Really Count"

Bound for graduate school at Iowa State University, Nancy Fortier, '83 CH, sees no reason to hesitate as she prepares further for an industrial career in chemistry.

Nancy was the 1983 recipient of the American Institute of Chemists Award, given at commencement to the outstanding senior chemistry student. Her special interest in high-performance liquid chromatography has applications in industry (for example, identifying and removing radioactive waste from water).

"I've never perceived any resentment over my academic success by the male students in my classes," she said recently. "And I don't expect sexual harassment in grad school or industry." The Hampden, MA, graduate believes that hard work—not affirmative-action measures—is what will enable her to advance in a field that is attracting more and more women. In fact, she says, employment quotas for women, minorities and the handicapped can be non-productive for the employer if such guidelines ignore ability to perform.

As increasing numbers of women enter the work force, especially in non-traditional professions, she predicts that their male colleagues will come to accept women as "equal," though for some men the process of change will be more painful than for others. She accepts things as they are and intends to encourage other women who may question themselves in a career.

Right now, Nancy hasn't begun to consider the family-career decision, but she knows that someday she'll have to face it. "A family and children are always in the back of my mind," she adds, "but for now, grad school and my career are most important."

"Opportunities For Women Abound"

When Anne Madara, '76 MA, graduated from WPI, she first thought she might go on to graduate school. Instead, she opted for "a taste of the real world," and went into industry. She hasn't regretted that decision.

Anne joined Polaroid Corporation as an evaluation (quality control) engineer in the firm's New Bedford, MA, plant. "I really enjoyed the job," she says, "but it led me into other areas. I had to interface with the systems department and discovered that systems was a career I wanted to explore."

Polaroid is an open company, Anne reports. Whenever a new job is available, anyone may apply for it, and being a woman may be an advantage. Industry, she believes, is always looking for qualified women to fill key posts.

After spending two years in systems, Anne discovered the company was looking for someone to run a data processing training program.

"It was different from anything I'd done before," she says. "I didn't know exactly what I was getting into, but I had the confidence to try. WPI had helped instill that confidence with its project requirements."

Anne has encountered little sexual prejudice in industry. Recently she was promoted to senior systems analyst supporting Polaroid's Technical and Industrial Photographic division in Waltham. There, Anne's task is to upgrade inventory systems. Last summer Polaroid sent Anne to observe systems at their plant in Scotland.

And for the future? "I may still go on to graduate school," she reveals. "But I don't plan to give up my job!"

WPI's mission, she said—to address *both* the technical and humanistic elements of engineering and scientific education—met her career and personal needs. The Plan, the embodiment of this mission, "has helped me not only in my job [Assistant Registrar of Nichols College], but in everything I do. I know enough to ask questions. I know how to ask the right questions. And I know that if I search long enough, I'll find the answers. I use this in my work in higher education. I understand the importance of how the learning experience should affect, mold and shape one's entire life."

Regarding WPI women, continued Paula, "We were better able to handle different things than other women in our high schools, especially the academics. Before WPI, we were among the best in our high schools. At WPI we were surrounded by classmates, men and women, as well prepared academically as we were, and therefore we didn't feel out of place. Now that we're out, we seem to be able to solve things and handle problems more easily. Upon reflection, I realize how special my education really was."

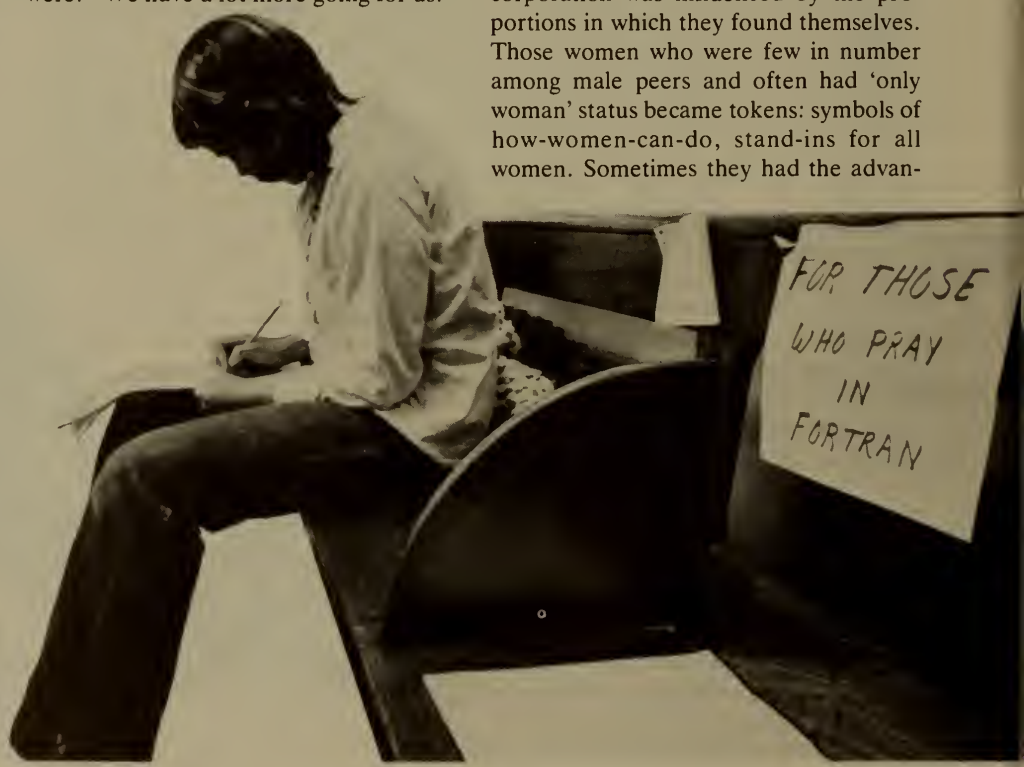
I asked a colleague of mine, Sarah Simon (MIT, '72), whether as women engineers, we are different. "At the risk of sounding boastful," she said, "I think we are incredibly self-motivated, compared to male engineers. We had a sense of ourselves when we were in high school and a sense of where we wanted to go, especially compared to other engineers and to other women."

Women starting in engineering today, she believes, are in an era in which the doors aren't shut as tightly as they once were. "We have a lot more going for us." Fifteen years ago, she went on, women had to ignore the inequalities present then in order to become engineers. So in many ways, they felt they needed to be better prepared than their male counterparts. Later, women found it easier to believe things weren't different. "It's not as difficult now for women to become engineers—and to be average engineers. At least that's what we keep hoping!! Even though we are all individuals, our experiences are not really that different."

Anni Autio, '82 CE, added, "Things are more relaxed now for women at WPI. You don't have to be super-intelligent."

Differences among us certainly exist by virtue of our individuality, but are we the same in any way? Or are we seen through undiscriminating eyes? In her book, *Men and Women of the Corporation,* Rosabeth Kanter reports on minority (women, blacks, the handicapped, etc.) infiltration into groups. She found that when a 65:35 ratio existed, a critical mass had been reached; the majority perceived the minority members as individuals, and the minority group was simply a type differentiated from the majority. However, at up to an 85:15 ratio, the dominant members weren't comfortable and the minority members were often treated as representatives of their category and as symbols rather than as individuals.

She wrote: "The life of women in the corporation was influenced by the proportions in which they found themselves. Those women who were few in number among male peers and often had 'only woman' status became tokens: symbols of how-women-can-do, stand-ins for all women. Sometimes they had the advan-



tages of those who are "different" and thus were highly visible in a system where success is tied to becoming known. Sometimes they faced the loneliness of the outsider, of the stranger who intrudes upon an alien culture and may become self-estranged in the process of assimilation. In any case, their turnover and 'failure rate' were known to be much higher than those of men in entry and early-grade positions." (p. 206)

In my professional experience, it seems that men seldom are aware of what women as the minority sex in most business environments may feel. I have never met another woman civil engineer in a professional situation, though admittedly civil is probably one of the last male engineering strongholds. The only other woman engineers I have met are WPI friends and colleagues from the Society of Women Engineers.

While in school, I worked during vacations for a small civil engineering/land surveying company. Miraculously, there was one other woman engineering student at the firm in a similar capacity. When I began my current job we employed a woman co-op student, but I have never worked in an office with another full-time woman engineer.

The numbers are startling. At May 1983 Commencement, 73 women, or 18 percent, were among the more than 400 students graduating in the class of 1983. Of these women, 50 (or 68 percent) graduated with civil, electrical, mechanical or chemical engineering degrees. My 1975 class of similar size graduated just 22 women, 8 of us (or 36 percent) in engineering. No woman mechanical engineers graduated that year, but ME, with 20 women, had the highest number of women in 1983. While Ann McPartland Dodd was the only woman electrical engineering major graduating in 1975, there were 17 in 1983.

These figures confirm one of Dean van A's observations of the shifting role of women at WPI. Women in the early classes were mostly math and science majors and normally ranked in the top third of their class. In those days, the smartest women

WPI Women In Dual-Career Marriages: Their Roles as Wives and Professionals

Beginning in pre-industrial, agrarian America, through the Industrial Revolution, World Wars I and II, the sedate Fifties, the turbulent Sixties and Seventies, and into the Eighties, the married woman's role in the workplace has been a roller-coaster ride of unprecedented scope. In their recent Interactive Qualifying Project, Daila Blaus, '84 CM, and Michele Bugbee, '84 CM, traced this saga and surveyed WPI women graduates involved in an increasingly widespread and vital phenomenon—the dual-career marriage.

When male labor was scarce (as during war), before products for the home were factory-produced, and when factories have needed skilled labor to mass-produce a host of traditionally home-made products, like clothing and soaps, women's labor has been essential to the nation's economy.

But when women returned to the home to manage the family and the household, as in the early 1900s and later in the postwar Fifties, their presence in the workplace tended to take on less importance. Yet child-rearing and managing the home left many women deeply bored and depressed and at odds with their innate need for self-realization and identity.

Today, according to feminist Susan Bolotin, the two traditionally prized female occupations—childbearing and homemaking—are no longer economically valued. For most women, working outside the home is not a luxury, but a fact of life.

In their study, Daila and Michele surveyed two groups of WPI women graduates of the classes of 1973 and '74, and 1978 and '79. They hypothesized that the older group, products of the more radical 1960s, would prove more independent, choosing to share traditional female roles with their husbands, and juggling child-rearing and career development simultaneously. The team believed that the younger group, on the other hand, products of the less activist early Seventies, would exhibit more family-oriented preferences, abandoning the unfinished campaign of the women's movement begun more than a decade earlier.

The results of their study, however, uncover mixed behaviors in both groups and point to the difficulty in stereotyping such diverse groups of women, regardless of their ages.

Women in each group felt secure in their decision to either remain at home with their family or continue their professional endeavors. However, group 1 tended to remain at home, while group 2, the younger women, were more willing to seek work outside the home. At the same time, group 1 felt a greater need to care for the home and children than did group 2, who were more willing to continue working at least part-time while letting others help care for their children.

Both groups expressed a firm willingness to sacrifice free time to spend with their husbands and children; and a common comment was, "Motherhood is the most important thing in my life." Furthermore, most women believed their husbands shared their commitment to teamwork.

In planning a career, both groups tended to place family considerations above their professions.

Perhaps the greatest difference between the groups appeared in the division of household labor between wife and husband. Husbands in group 2 tended to take on more household chores, like cleaning, than those in group 1. Still, women did most of the cooking in both groups.

Partners in both groups seemed equally committed to a sharing of financial responsibilities and family emotional support. The belief that family bonds strengthen when both partners work outside the home was common.

Finally, in both groups women reported experiencing widespread professional discrimination—subtle rather than direct. Men, many women said, are respected and promoted much more quickly on the job than women. Said one respondent, "For women, it takes more years of service to be considered a 'company man.'"

"For Women, The Choices May Be Harder."

"Actually," recalls Leslie Small Zorabedian, '72 MA, "two of us entered as freshmen that first year, 1968. But since she dropped out and I remained, I suppose I am the first woman WPI graduate."

As you might imagine, a folklore has emerged over the last decade around the woman who, in her own word, "crashed" venerable old, all-male WPI. Sorority pledges, for example, must still know her name as part of their rites of initiation.

Consider her times. The late Sixties were a period of national awakening to events and values previously beyond the realm of widespread debate, now become issues of violent protest, largely at campuses across the country.

Enter, in the middle of all this—an unpopular war, students' rights demonstrations, the women's movement, the early years of the WPI Plan—young Leslie Small, valedictorian of the Spencer, MA, high school, who'd grown up on a farm, whose dad, before he died, often said how nice it'd be if Leslie could go to "Tech" as sons Jim, '70, and Lester, '67, had. One gets the distinct impression that in entering WPI as its first woman, hers was not a radical act. "I thought WPI was the best. I just wanted an excellent education. Actually, I was asked to apply."

Leslie Small left her mark here, not through protest, but through the excellence of her work and her positive contribution to campus life. She served Tau Beta Pi as its first woman president and was a member of the Skull.

"That first semester was lonely," she recalls, "mostly because I commuted and didn't get too involved socially." She earned straight As that fall. "I wanted to be accepted for my work, not because I'm a woman."

It was during class elections that she met Jack Zorabedian, '75, a candidate. They married several years later, when they were both on sound career paths, he at General Electric, she at New York Telephone near Albany.

Leslie and Jack didn't escape the pressures of a dual-career marriage. "Always there are the decisions over jobs, locations, children," she says, "—the compromises and sacrifices that each of us have to make to make the marriage work." Finally, not without hesitation, she postponed a very promising career to give her full energies to their children.

Today, Cindy, 8, John, 6, and Jeff, 3, are the loving products of that decision of nearly a decade ago. "I wouldn't have missed a minute of my children's babyhood."

Presently, Leslie is a math instructor at North Shore Community College. At this point in her life, she is eager to return to college and to more teaching, a profession that she's finding increasingly rewarding—hoping to balance her needs for career and family.

in a high school would be encouraged to come to schools such as WPI if they liked math and science.

Women in more recent classes, however, have been predominantly engineering majors. As the number of women in engineering and technical fields has increased, more of the gifted high school women have become interested in WPI.

Presumably early women students didn't major in engineering because, like me, they had little idea of what it was. Awareness of the engineering fields and opportunities available has increased; hence the swing to more engineering majors. In earlier classes, women were strong in math and science but thought more in terms of teaching than of pursuing industrial careers. Now they are studying engineering and science to put their skills and interest to practical use.

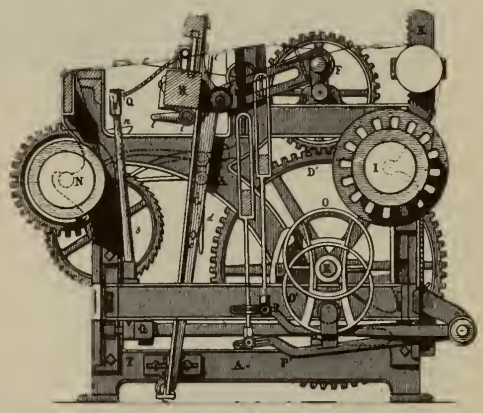
Consider some other interesting statistics: In 1952 0.2 percent of the nation's BS degrees in engineering went to women; in 1975 as a group we received 2.3 percent. In 1979 the figure was up to 9 percent, and in 1980 a whopping 5,631 bachelor's degrees in engineering, or 9.7 percent of the total, were awarded to women.

The National Science Foundation estimates that in 1978 21,700 (or 1.6 percent) of the nearly 1.4 million U.S. engineers were women. Today that figure is close to 4 percent. In 1979, 14,000 freshman women declared engineering as their college major. That year, 49,027 (or 12.3 percent) of the U.S. college engineering enrollment were women. Can there be any doubt that women are gaining a firm foothold in engineering and, further, that WPI women *are* making a difference in these enormously challenging yet exciting times.

In December 1982, the Boston Section of the Society of Women Engineers (SWE) honored Judy Nitsch *with its National Distinguished New Engineer Award, the latest of several awards for her.*

A project manager with Boston's Allen & Demurjian, Inc., a consulting civil and structural engineering, architectural and surveying firm, Judy specializes in site planning and development. She is a Registered Professional Engineer in eight states. In 1980 she was featured on the "New England Today" TV program and on NBC radio's "The Woman's Program." A member of WPI's Alumni Publications Advisory Committee, she is coauthor of Terry's Trip, *a coloring book introducing engineering careers to grade-school girls.*

Over the next decade, industry-supported academic research will increase from $200 million to about $600 million a year. The stream of money is widening and deepening; the exchange of ideas and people is increasing; even optimists are concerned about paying the piper.



Academe Meets Industry:

Charting the Bottom Line

by Elise Hancock

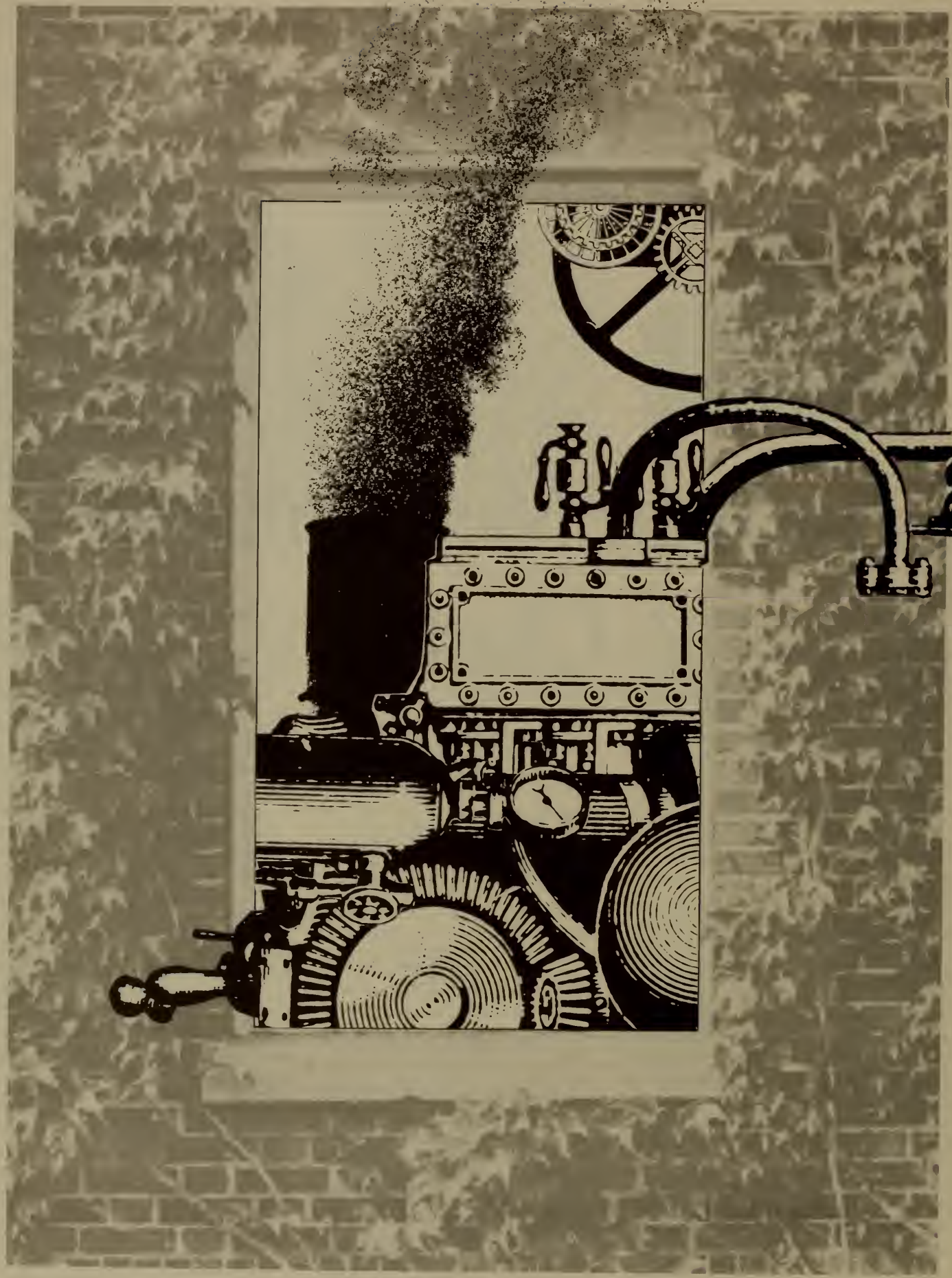
Crudely speaking, the purpose of a business enterprise is to provide goods and services for a profit, while the purpose of higher education is to produce knowledge and educated people. Industry needs both the knowledge and the people, while academe needs money. Therefore it would seem that industrial funding could underwrite parts of academic research and education, to the benefit of all—including society as a whole.

Indeed, while the federal government has reined back on its support for academic research and training, industries have moved in to help fill the gap. At MIT, according to TIME magazine, private contracts jumped from $6 million in 1979 to $18 million in 1981. At the Johns Hopkins School of Medicine, industry used to provide 8 percent of its research funding. In the last three years, that number has gone up to 15 percent. Over the next decade, nationwide, Edward E. David, Jr. (president of the Exxon Research and Engineering Company) estimates that industry-supported academic research will increase from $200 million to about $600 million a year.

Two caveats: Despite the federal budget-cutting, even that $600 million will be, at most, 15 percent of the billions provided by federal agencies. Secondly, these numbers are all less precise than they sound, because the financial categories are imprecise. Is a grant to support a graduate student philanthropic, or is it a type of public relations and therefore a cost of doing business? How to value secondhand equipment given to schools? Or new equipment, for that matter. Does a student internship have financial value? Different companies keep books in different ways, and many arrangements between schools and industrial firms are locally and informally handled; they may never enter the corporate books at all.

Clearly, however, the stream of money moving from industry to academe is widening and deepening; the exchange of ideas and people is increasing, and even optimists find themselves concerned about paying the piper.

For seldom before could anyone say that a company had bought a department—as one could literally say of the new Department of Molecular Biology at Massachusetts General Hospital (MGH, which is affiliated with Harvard Medical School). Hoechst A. G., a West German chemical company, is putting up $70 million over ten years to completely equip and support the department, down to the last piece of filter paper. Work will be on somatic cell genetics, microbial genetics, virology, immunology, plant molecular biology, and eukaryotic cell gene regulation. MGH "agrees to do nothing" that might give any other entity a claim on work done by the department, staff members may consult only for non-profit making entities, and Hoechst gets exclusive world licenses—or the best possible license—for any commercially useful results. Most members of the scientific staff are expected to hold faculty positions at Harvard. Hoechst



may have four company scientists at any one time in training in the department, working on problems chosen by the chairman, distinguished geneticist Howard Goodman. Goodman says it's just like a grant, and he plans normal academic collaboration with colleagues at Harvard on projects with NIH funding. He'll need an OK from Hoechst, though.

Does that matter? Many would argue not. Hoechst presumably entered into the agreement because Goodman *et alia* have expertise the corporation does not. Goodman is allowed to follow his well-schooled intuition about what fundamental questions will be most fruitful, Harvard finds the center a magnet for faculty, the department trains people for Hoechst who will be able to work on likely applications, and the world at large will gain wonderful new drugs, self-fertilizing crops, ways to combat genetic disease, who knows? If Hoechst makes money, why not? Surely it is entitled to a reasonable return on its investment.

On the other hand, there is that implicit leash: Goodman *et alia* will presumably want the contracts renewed. Does that mean they will inevitably begin slanting their work for the quick return, something that will show Hoechst its investment was wise? Will they stop asking the tough questions, ones that will yield applications only 20 years from now if ever? Will they skimp on their teaching duties? In short, do arrangements like this one constitute eating the seed corn?

There are a number of such concerns, many of them voiced by academe and industry alike. Yet the contracts, large and small, continue to proliferate, and for compelling reasons. These reasons, and the worries, together are reshaping many academic departments.

"A problem we all have can be summed up in one word," said one industrialist at a conference: "Japan." Japan has mounted an effort to do to the computer field what it has done to automobiles and threatens to do in biotechnology: dominate the world market. U.S. industry is running scared.

At the same time, academia finds itself strapped. A few years ago, roughly half of research proposals submitted would garner a grant. Today, only about a quarter do (at least on first submission). Young researchers, generally conceded to be the most innovative, are less likely to win grants than are people you might call "proven products"; the young waste even more time writing fruitless grants than do senior people. Federal training grants are largely a thing of the past, and money for equipment is also becoming hard to get—at a time when more and more scientific fields require high-tech tools. "They told me they'd only pay for one-third of it, and I'd have to share the cost with people who need the same microdensitometer," said a faculty member plaintively. "But I could only find one, and he works on another campus." His story is not uncommon.

Furthermore, both industry and academia find themselves short-handed. According to the American Electronics Association, U.S. electronics and information-technology industries will need nearly 200,000 new electrical and computer science engineers during the next five years. The nation's colleges are expected to produce only about 85,000 graduates with those skills. About one-quarter of faculty posts in engineering colleges are vacant, for lack of qualified people, and the number of engineering doctorates granted continues to fall. There were 3,600 engineering PhDs granted in 1970, but only 2,800 in 1981—and not all of those are a gain. In 1980, according to the National Science Foundation, foreigners earned 46 percent of U.S. engineering doctorates, 22 percent of those in physical sciences, and 27 percent of those in math. Many of them return home. Japan graduates 75,000 engineers annually, the Soviet Union 300,000. The United States graduates only 63,000, and the percentage of scientists and engineers in the labor force has been dropping since 1965.

Part of the problem is that industry is eating the seed corn itself: because of the shortage, industrial salaries are so high that fewer engineers choose to go on to graduate schools, and fewer fresh PhDs choose to teach.

In an important sense, then, the new academe-industry agreements can be viewed as people-sharing. Industrial support of research keeps the teachers teaching, the students learning, and the research coming. When several companies band together to sponsor generic research in a university lab, it helps avoid duplication of effort. In every way, it leverages the available mindpower.

It does so, moreover, at a time when industry has just been reminded how profitable basic research can be. In the postwar years, it seemed to take an idea 15 to 20 years to move from the basic research stage to usable technology. Recombinant DNA technology, though, has taught that the time lag is not inevitable.

Once the Supreme Court ruled that a microorganism could be patented—once it had been changed—the race was on. Insulin grown in bacteria, antibodies tailor-made to hone in on cancer cells, living soups that will clean up oil spills—these are not fantasy, a bare ten years after the initial discoveries. The insulin is already on the market; DNA-made interferon is going through clinical testing. And most of the work took place in universities.

"Industry got caught with its pants down," crowed one university administrator. "They weren't paying attention." The first companies into biotechnology were mostly small firms formed by university faculty members with dollar signs dancing in their eyes. Now industry is buying expertise, sponsoring university work, and establishing centers.

Nor will it forget soon to pay attention. Many departments in many disciplines are offering affiliate relationships, in which a small fee—$5,000 to $20,000, say—buys a "window on research." The window usually consists of occasional symposia, a newsletter, and access to faculty and students.

Nobody questions the value of the relatively simple window programs. It is always good to view your work from someone else's point of view, and the window offers that advantage to both industrial and academic people. The fee is trivial for the company—even a small company—and demands on faculty time are minimal. Consulting and collaboration may develop, which is useful to both parties. Alan Goldberg, director of such a program at the Johns Hopkins School of Hygiene and Public Health, sums up: "There are things we're doing that are needed by industry, and they don't know we're doing it and we don't know they need it. That's why the interaction is so important."

When interaction gets more complicated, though, other factors come into play. Are industrial engineers dealing with academic engineers? In that case there is likely to be little trouble. As Edmund T. Cranch, president of Worcester Polytechnic Institute (WPI), points out, academic engineers have been working with companies for decades. "The industrial links are absolutely natural." Engineers often move from industry to academe or the other way; the value systems differ little.

An academic scientist, however, is often a person who could have been an engineer. By temperament and abilities, he or she is a person who likes to solve problems—but who chose less tangible prob-

Companies prefer that a new technology be a well-kept trade secret, like the formula for Coca-Cola. But academicians say they must have freedom to discuss and publish their research.

lems, for whatever reason. Usually the scientist chose academic science despite knowing that engineering or industrial science would probably bring a higher income. Academic scientists may or may not care whether there is any immediate application for their work, or even a long-term application, and they may or may not communicate easily with their industrial counterparts. Certainly the values of academic science and industrial science differ.

In a recent talk, Lewis Thomas, chancellor of the Memorial Sloan-Kettering Cancer Center, claimed that applied researchers thought of themselves as practical, hardworking types wielding science for useful ends while the basic scientists, a "dreamy, unworldly lot," worked without real purpose. On their side, Thomas said, the basic scientists considered themselves the only real source of scientific knowledge and saw the applied scientists as "money grubbing day laborers." The greater traffic between industry and academe is changing these stereotypes, Thomas argued, finding the shift a reason to applaud the new arrangements. Still, the comment has the sting of a near-truth; if not those attitudes, the ghosts of those attitudes persist. They interfere.

Second, the intellectual turf also seems to matter. In biotechnology, as witness the MGH/Hoechst agreement, academe has knowledge that industry badly wishes to buy. Furthermore, the work is done with equipment a home laboratory could easily amass. The contracts generously cede almost anything the universities care to ask. But in areas like computers and robotics, the knowledge and—very importantly—the expensive equipment are in industrial hands. In these cases faculty and student access to equipment is often the school's major gain. Francis C. Lutz, associate dean for projects at Worcester Polytechnic Institute, says bluntly, "It could be advantageous to give up some of your rights, in return for getting ahead by two years, as industry often is ahead." Equipment can be a big factor in keeping—or not keeping—desirable faculty and students.

Third, the clout of the academic institution is critical. Home of the heavy hitters, the ones industry wants to work with, major universities are able to negotiate conditions: that all work can be published in scholarly journals—though after a brief delay so the sponsor can patent useful material. Or that the university holds the patent and collects royalties.

Foremost among the issues that come up in negotiations between industry and academe is secrecy. As an ideal, companies prefer that a new technology be a well-kept trade secret, like the formula for Coca-Cola. That way may lie a huge profit. Patents are the second-best choice. In general, entrusting proprietary information to people outside their own laboratories seems to companies dangerous. How can their secrets be protected?

But from the academic point of view, complete freedom to publish and talk about work is not merely ideal, but essential. Said one dean of research, "If we do *nothing else*, we've got to protect our freedom to publish as we do. We have to preserve academic openness. In my view it's like personal virtue—to be compromised just once is enough." Said Richard Zdanis, vice provost at Johns Hopkins University, "If a researcher on his own discovers something he thinks is commercially valuable, all he needs to do is keep quiet and the delicate fabric of academic life is already damaged."

Why? Isn't this degree of caution exaggerated?

Pushed to explain why he thought not, Zdanis offered an example from the Space Telescope Science Institute, which is on the Hopkins campus. The Space Telescope staff find themselves delighted with

Conflicts of Interests

"My feeling is that universities are far too conservative. They sat out the microelectronic revolution. Now the biotechnical revolution is coming along, and they can't afford to sit that out. What we have to do is protect the university by putting it in a position where it is not in control, where it only owns minority stock, where faculty members serve only as consultants. We have to keep the university simon-pure and clean. But we have to let the university grow with the bionic revolution."

—Wayne S. Brown, Director, Innovation Center, University of Utah

"Some academic institutions live or believe they live in a risk-free environment—but the world outside is risk-laden. Ethical statements get tested in real life, by specific cases, with the introduction of money. That's when the soul of the university gets tested."

—Edmund T. Cranch, President, Worcester Polytechnic Institute

"As times get harder, all donors will be more apt to try to call the shots—not just corporate sponsors. Colleges will increasingly face the question, Do I accept the gift and the strings that come with it, or do I refuse?"

—James L. Powell, President, Franklin and Marshall College

"The manufacturing sector is only 25 percent of the GNP, roughly, but 65 percent of it derives from manufacturing. Service doesn't generate money. The U.S. cannot survive selling raw inventions and services—I don't think the U.S. wishes to be the laundry capital of the world."

—Leo Hanifin, Director, Center for Manufacturing Productivity and Technology Transfer, Rensselaer Polytechnic Institute

"The average car has about 16,000 parts; all 16,000 of those parts will come together and make a perfect car. If you, as manufacturing supervisor, had to be sure that this car appeared on schedule, you

might just go a bit overboard to make sure that you used nothing but absolutely proven technology. . . . Consequently, when you approach manufacturing people with the idea of new technology, they are something less than enchanted."

—Thomas O. Mathues, Vice President, General Motors

"The decision to settle on just one school is not smart business. The actual research community is apt to be spread through half a dozen or more schools. It's better to support the field as a whole."

—John Schaefer, President, Research Corporation

"For obvious reasons, it would be imprudent for business to support undifferentiated research: when it pays off it pays handsomely, but it does so infrequently. Likewise, it would be a clear misappropriation of federal funds to *develop* these discoveries into commercial use. Development will happen without institutionalizing it."

—David A. Blake, Associate Dean for Research, School of Medicine, Johns Hopkins University

"If we assert that industry's welfare depends on the basic infrastructure of research at universities, then a mechanism is needed. Is it unreasonable to conceive of an 'Industrial Science and Technology Foundation' to match in size and scope the government's National Science Foundation?"

—Robert M. White, President, National Academy of Engineering

"My view is that we make a product for them—our students—and they should help pay for it. Their view is that they're doing us a favor in hiring our students. Industry at large does not think enough about small schools. The big schools will not produce enough engineers."

—Yi Hua Ma, Head of Chemical Engineering, Worcester Polytechnic Institute

"How do we address the needs of the smaller companies? . . . Such companies can and do compete effectively for our students. They can and do send students here for continuing education programs. But such a company cannot afford to be a member of [M.I.T.'s] liaison programs; the fees are too high. Yet we know that some of the most innovative companies in the country are these smaller ones. How do we interact with them?"

—James D. Bruce, Director Industrial Liaison Program, M.I.T.

"Ten years ago, companies made stuff and screened it at random and tried it on animals and hoped you'd stumble on something. Now medical research has come so far that good basic research is relevant to drug development." About the NIH: "That H is for Health, not Hobby. We're on NIH money so we should be trying to work on material with practical relevance. Otherwise universities are wasting time."

—Solomon H. Snyder, School of Medicine, Johns Hopkins University

"Look out for the price. Watch the price very carefully. Because so often when Athena, who is the goddess of wisdom, comes in contact with Mammon, who is god of money, it is Mammon who comes out on top."

—DeWitt Stetten, Jr. National Institutes of Health

"DNA is like Midas's gold—everyone who touches it goes insane."

—Frank Press, President, National Academy of Sciences

"The Gross National Product is an unfortunate phrase, because what it really means is the gross national saleable product. It does not include such products as the products of Homer, of Mozart, or of Michelangelo."

—DeWitt Stetten, Jr.

"Our job with these students is to make sure that whatever they said they wanted when they came here, they end up getting a liberal education. We don't trouble ourselves a great deal about biasing the search for knowledge in some way. Harvard has to worry about that. We don't. Our virtue is protected because nobody really wants to violate it."

—Bryant L. Cureton, Dean, Hartwick College

"The development of technology-based emphasis in education does have ominous implications. We can't afford to lose our English departments or classics departments or history departments, though they don't need the same magnitude of support that science subjects do. We're living in a technological society, and if an attitude develops that these are nice frills but that it's technology that deserves our support, that will lead to a skewing of values."

—John Schaefer

"If your main purpose is not education, you're not a university, you're a research institute."

—V. David Vandelinde G.W.C. Whiting School of Engineering, Johns Hopkins University

"Liberal arts students should learn not to be afraid of computers, and we should either require, or make it very easy for, students to get personal computers. But they don't really have to *know* anything about computers. I don't know how this telephone works, and computers will be the same way in 10 years or less."

—James L. Powell

"Whatever relations we have formed with industries have first of all developed out of educational projects. It is essential that they happen this way."

—George M. Low, President Rensselaer Polytechnic Institute

"An academic lab is like an industrial lab *except* it's half trainees. Our students are unencumbered and eager and new—that's very valuable. The science in many industries is first-rate, so what they want is our students and our ferment. An institute that is not training students will not have the ferment of a university."

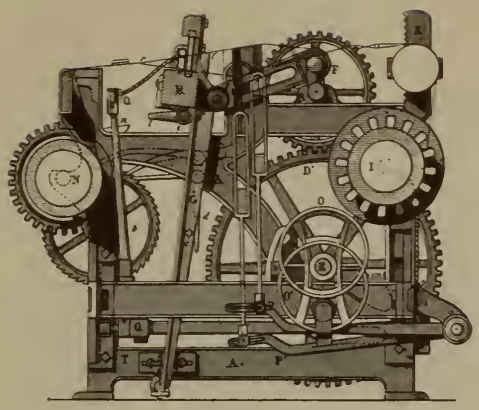
—David A. Blake

"Skilled and dedicated graduate students are one of the last remaining pools of cheap labor anywhere in the world today. Industrial labs are hard pressed to match the quality of this working force in the better universities, even at a significantly higher cost."

—Lewis B. Gustafson, Conoco executive

"If universities train people who are not state-of-the-art, then it's several years before they become effective for industry. So it's really cheaper to keep us state-of-the-art—but they've got to help us with the equipment. Otherwise, their own people with their sophisticated scientific temperaments will have doctorates from where? Of what quality? I think that's really the issue."

—Steven Muller, President, Johns Hopkins University



Are we eating the seed corn? Because of the shortage of engineers, industry salaries are high. Therefore fewer students choose to go on to graduate school, and fewer fresh PhDs choose to teach.

the academic atmosphere, he said, because they can do better work. Example: A measuring device for the Telescope would not behave itself, and the staff talked it over with faculty members. A metallurgist recommended a mounting block with the same coefficient of expansion as the instrument, to avoid distortion—and it helped. Someone else advised them on humidity and other atmospheric problems that might be affecting performance—and it helped. After all the casual consultation, the instrument out-performs its manufacturer's specifications. And, Zdanis concluded triumphantly, for very high quality work it is vital to have this kind of daily discussion of the "*details*—details that might at some time have commercial value." Academe is a house built on trust.

This secrecy issue looks intractable, but in practice it can be worked out. In recent contracts, the usual arrangement is that the corporation gets a first look at any papers, and that publication may be held up—sometimes as long as 120 days—to allow the company to file for a patent. The normal delays of academic publishing are at least that long anyway.

More iffy is the question of *international* patents: In U.S. law, presenting an oral report at a conference would not bar a patent. But in the rest of the world, it seems that *any* communication of the work—"enabling disclosure"—may jeopardize the patent. How then to have peer review? In a recent survey by Donald Fowler, Caltech's General Counsel, university people declared the secrecy issue to be the most serious impediment to industry/university cooperative research.

And what did industry view as the main impediment? What Fowler calls the "asserted fact" that industry has its own research capabilities, and would use them wherever there was "no clear-cut cost advantage or unique capability on the part of the university."

"Unique capability" often means an academic superstar who cannot be lured from academe, and such exist. Young professors have been known to turn down multiples of their university salaries because they prefer to work on campus.

The cost advantage is where cooperative research centers come in. The centers that succeed come close to being all things to all people. They provide meaningful projects for students—usually graduate students—who are supervised by faculty, who thus maintain contact with industrial realities ("a sanity test," one Rensselaer Polytechnic Institute professor calls it). Students also get an introduction to industrial realities: "Time constraints, money constraints, having to work in a team—students learn all these things in working with industry," says WPI President Cranch. "So if we can expose our students to that, we feel it's a tremendous advantage."

For the sponsors, a sum like $20,000 each year will typically buy work on a project of their choice, a chance to improve recruiting by knowing students well, access to faculty, the nonproprietary results of work performed for other sponsors, and seminars for employees. Says WPI Dean of Faculty Ray Bolz, "Often students don't know something can't be done, so they do it."

Some cooperatives effectively develop proprietary secrets of their own. At the Center for Interactive Computer Graphics at Rensselaer Polytechnic Institute, any software developed for one sponsor is shared with all sponsors, but only for their internal use. Asked whether secrecy was a problem, Director Michael J. Wozny looked blank. Software can be valuable, but the possibility of trouble was obviously a new thought, which would seem to indicate that everyone honors the agreements. So far, 30 companies have joined that center and none has left.

At the same center, enthusiastic sponsors have donated equipment worth about $4.5 million, which is beginning to reverse the brain drain to industry. Most of the research is done by master's degree candidates (supervised by full-time staff), some of whom are now staying on for PhDs. That's partly because few industrial plants can begin to match the equipment of the Center, Wozny explains.

Such a center is obviously good for students, who are exposed to a rich variety of projects and equipment. And that's the point, to RPI President George M. Low. He feels a university/industry link can succeed *only* if the program has intrinsic educational merit. Otherwise, there will be transplant rejection.

The center concept also eliminates the possibility that a sponsor might dictate unacceptable terms: There are too many sponsors. Hoechst might possibly be able to dictate to the department it created. But no $20,000 sponsor, even a mighty giver of equipment, can dictate terms. "Even if company X wanted us to do something foolish," says Low, "we would be in an awfully good position to tell them to go to hell, because in any given year our income from any one company would be a tiny fraction of our income."

As well as the many university centers, industrial firms are themselves establishing centers, including the Semiconductor Research Cooperative (SRC). This nonprofit foundation is linked to the Semiconductor Industry Association and is intended to reestablish U.S. supremacy in integrated circuitry. Erich Bloch, IBM's vice president for research and chairman of SRC's board, says that Japanese companies have captured about 40 percent of the market for the current generation of computer memory chips, the 16K RAM. It is projected they may take 70 percent of the market for the 64K RAM. Enter SRC, with plans to commission long-term basic research from universities on such topics as computer-aided design, alternative semiconductor materials, and new ways to imprint circuits on silicon chips. Industrial members will contribute in proportion to their total semiconductor sales or to the value of the semiconductors they use in their products.

The other big new industry effort is the Microelectronics and Computer Technology Corporation (MCC), a $50-million-a-year joint venture of 12 high-technology companies. Research will focus on CAD/CAM, computer architecture, software technology, and packaging. Sponsors buy into each project separately, goaded by the knowledge that those who fund the project get a 3-year lead on licenses for any products—while companies that are

A professor's first loyalty should be to academic work. If he is also an investor in a biotechnology firm, how will that affect his work?

shareholders but didn't join the particular project gain no advantage. The research will be performed by research people from member firms. MCC represents the brute force approach to the problem.

The most imaginative research organization is a hybrid with four parts: the Center for Biotechnology Research, which is the central element and contracts with universities—Stanford, Berkeley, and MIT, at this point—to do *basic* research in production and product separation processes. The universities (part 2) are independent contractors and will hold any patents. The sponsoring companies (3) can get options for licenses to the patents—and so can (4) a unit called Engenics, which is the profit-making unit. Engenics will perform *applied* research and process development in biotechnology and genetic engineering. The corporations, the founders, and the Center hold equity in Engenics. If Engenics proves profitable, the Center's 30 percent take will allow it to continue to contract for basic research. The idea is to prevent conflict of interest.

Of all the various problems created by the new order, conflict of interest is one of the most vexing. A professor's first loyalty should be to academic work. If he or she is also an investor in, for instance, a biotechnology firm, or a principal of the firm, how will that affect her academic work? Can the principal of a firm ethically participate as an academic worker on research grants contracted by the firm? Or can his students? Will a financial interest skew judgment of the student work or of the professor's own work? Many universities are now asking faculty members to disclose any outside commitments.

Disclosure rules sometimes lead to losses, as in the case of Walter Gilbert, a Nobelist and former professor of molecular biology at Harvard. Gilbert was also an executive with Biogen, S.A., an international research firm. In 1982, when Harvard imposed new rules about conflict of interest, Gilbert was asked to leave the university and has become Biogen's full-time chairman. Some computer people are also leaving university life in order to form their own corporations. Individuals are entitled to make their own choices, but those leaving are often those whose work is of the highest quality.

At first blink, patents appear to be a problem also, but most people in universities no longer worry about it. The Patent and Trademark Amendments of 1980 give universities, small businesses, and nonprofit organizations the right of first refusal to title in inventions made under government contract. Previously, the federal government held the patents and refused to give exclusive licenses, on the grounds that the public had already paid for the research. However, too few companies were willing to go to the expense of developing a product to which they could not hold an exclusive license, so the ideas for which the public had already paid languished in the patent office.

Many universities now claim patents and share royalties with the inventor—often also with the inventor's department or school, and even the inventor's research. "That's what they *really* like," said one administrator confidentially. "It's tax free and it ensures the continuity of their work." Many universities will grant an exclusive license, but under conditions: if the licensee does not develop and market the product, the exclusive right is lost.

However, the issue seldom arises. Before the eruption of biotechnology, scholars were seldom inventors. "Look," said one administrator. "Look how few big inventions have come out of universities—warfarin, Vitamin D, the laser, stannous fluoride—there are so few of them you can count them on your fingers." Carnegie-Mellon, for one, has decided not to seek patents but to let the industrial sponsors have them.

A last worry, in the flood of glamour biology and computer studies, is that the liberal arts will submerge. To much of the public, they already seem less and less "relevant," and occasional schools are phasing out Classics departments and some foreign languages. "Possibly," responds Richard Zdanis, "but whether universities participate in research consortia or not, that's going to be a challenge. In a sense we're reliving the Sputnik era, and we have to be concerned about overaccommodating. But universities only began to flourish, really, when they came out of the monastery and began to interact with society."

All these worries may well be premature, for the temptations may pass. Joshua Lederberg, president of Rockefeller University, recently told a bar association colloquium in New York that the present situation is an "aberration." He sees the cooperation as industry scrambling to draw on university talent it does not yet have in-house. Agreements, he notes, mostly call for industry researchers on campus, for pre-publication reviews, for seminars. Industry is getting educated.

Meanwhile, one trend is apparent: the corporate money tends to go to the academic haves, rather than the have-nots. Digital Equipment Corporation is giving MIT nearly 2,000 personal computers, terminals, and work stations, as well as 63 minicomputers over five years, while IBM is giving the school about 1,000 personal computers. MIT will use this material to develop a computerized curriculum. Motorola is a highly selective industrial associate: MIT, Stanford, and Caltech. RPI's new Center for Integrated Electronics received an electron-beam lithography system, one of only three such machines ever built, as a gift from IBM.

Hartwick College, by contrast, gets a small IBM grant to help retrain two professors to use and teach computers. Franklin and Marshall College gets $60,000 from the Research Corporation (a foundation) to support chemistry, because the Research Corporation has discovered that the majority of graduate students in chemistry have graduated from liberal arts colleges. Such primarily undergraduate schools do not attract the big bucks, and the gap is widening between the haves and the have-nots.

From a corporation's point of view, those particular decisions are easy to defend. If you wish to computerize scientific curricula nationwide, you will start at the school which is likely to produce many future

departmental chairmen. That's MIT. And Hartwick was delighted with its grant, which provided exactly what it needed. It must be remembered, though, still crudely speaking, that corporate boards expect a return on money spent, and money spent—or not spent—indicates corporate priorities. To be fair, there is also a certain inertia in systems run by human beings; it is hard to think through all details affected by a new situation.

People like Exxon's Edward David have pleaded convincingly for more basic research. The U.S. will spend $80 billion on R&D this year, David has written—over two-thirds of it for development. He writes:

"The process is so expensive and so slow because we are receiving inadequate help from predictive science. In the petroleum and chemical industries, we typically must build pilot plants costing hundreds of millions of dollars to determine whether and how we can practice a technology on an industrial scale. The reason is that we still know too little about the structure and chemistry of hydrocarbons and this applies particularly to synthetic fuel resources like coal and oil shale. There are similar problems in other industries. Designers of aircraft and steam turbines spend heavily on wind tunnel tests because they lack a good theory of turbulence and of materials failures."

In Donald Fowler's survey, both university and industrial people called for more basic research, and both see a significant correlation between the amount of money spent on basic technological research and future technological productivity. Of the academicians, 98 percent believed that such a correlation existed, and 89 percent of those in industry agreed. Still, substantial segments of industry show only a verbal commitment to higher education and basic research.

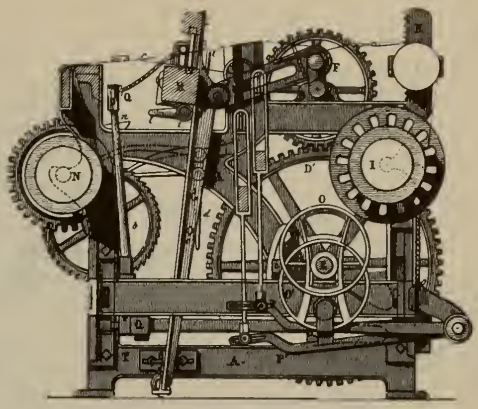
Item: Westinghouse Educational Foundation contributes more than $2 million each year to various universities for faculty development and structuring curricula, according to Westinghouse Vice President Roy V. Gavert, writing in *CHANGE* Magazine (April 1983). That sounds good. Then on another page, one learns that Westinghouse also spends $27 million on in-house education programs for employees. It does seem that some of that $27 million could have been spent sending Westinghouse employees to take appropriate courses at local colleges which need students. It might well have been cheaper and better to do so.

Item: It is generally agreed that the dwindling supply of PhDs is a serious problem, and the American Chemical Society has organized something called the Chemical Research Council, which is intended to promote cooperation between industry and higher education. Now in its second year, the Council has 40 industrial members, including Dow Chemical, Exxon, Monsanto, and the Shell Development Company, and 141 university members. The Council's first project is to distribute industrial money from a kitty, which is to be divided among university members based on the number of PhDs graduated in chemistry and chemical engineering. The present 40 corporate members are better than 20 corporate members, the number of the first year, but it's not many. It will be interesting to see how many corporations take up this straightforward way of helping universities meet the need for PhDs in chemistry.

Item: the comment and suggestion of Harit Majmudar, professor of electrical engineering at Worcester Polytechnic Institute. You might say he's on the front lines. Majmudar says flatly, "When industry really begins to feel the pinch in terms of qualified students, they say they've got to get involved. When they don't feel a pinch they won't care one iota." The market for electrical engineers is now very competitive. "So every week I get a call, 'We want to have a better relationship, what can we do for you?' " He thinks the answer is obvious: be involved *on a continuing basis*. "They can see where we are hurting. Engineering education in particular has needs for equipment and supplies which have become very costly. These are not capital expenses, these are operating expenses. And we need fellowships." And, he concludes, we need to "find people in industry who can participate as professors. The concept of practitioners on one side and professors on the other—we should abandon the schism. We need to do this *as a corporate decision*, not just allow one guy to teach night school."

Consider also an organization called the Life Sciences Research Foundation (LSRF), founded by Donald D. Brown, a prominent Baltimore biologist. The other organizers are David Baltimore, Paul Berg, Konrad E. Bloch, Arthur Kornberg, Daniel Nathans, Hamilton O. Smith, James D. Watson, and Lewis Thomas. All but Brown and Thomas are Nobel Prize winners. These scientists are concerned that federal budget cuts and industrial interest in biomedicine will, at best, divert universities from fundamental research.

LSRF seeks 30 postdoctoral fellowships a year, at $30,000 each, for young scientists chosen by an LSRF peer review committee to do basic biological research, non-targeted and with no strings attached. (The young scientists are expected to visit their sponsor corporations, however.) Considering tax breaks, the actual cost to a corporation would be about $13,000. Given the caliber of the organizers, you'd think this could be a remarkably economical way to sponsor life sciences research at the very front line, where recombinant DNA was 15 years ago. You'd think sponsors would be waiting in line.



"When industry begins to feel the pinch in terms of qualified students, they suddenly say they've got to get involved. When they don't feel a pinch, they don't care one iota."

After a year of hard work, Brown has found support for only 11 three-year fellowships, ten from companies and one from a foundation, and six pledges for future years. Monsanto (chemicals) and Hoffman-LaRoche (drugs) became sponsors immediately for two Fellows each and helped with the fund-raising. LSRF has two objectives: to strengthen research and teaching in the life sciences, and to convince industry that they're giving wrongly, in too short-sighted a way. "They're used to getting it free," Brown says. "For years the government supported all this work and trained all these people—the corporations need to adjust to new times."

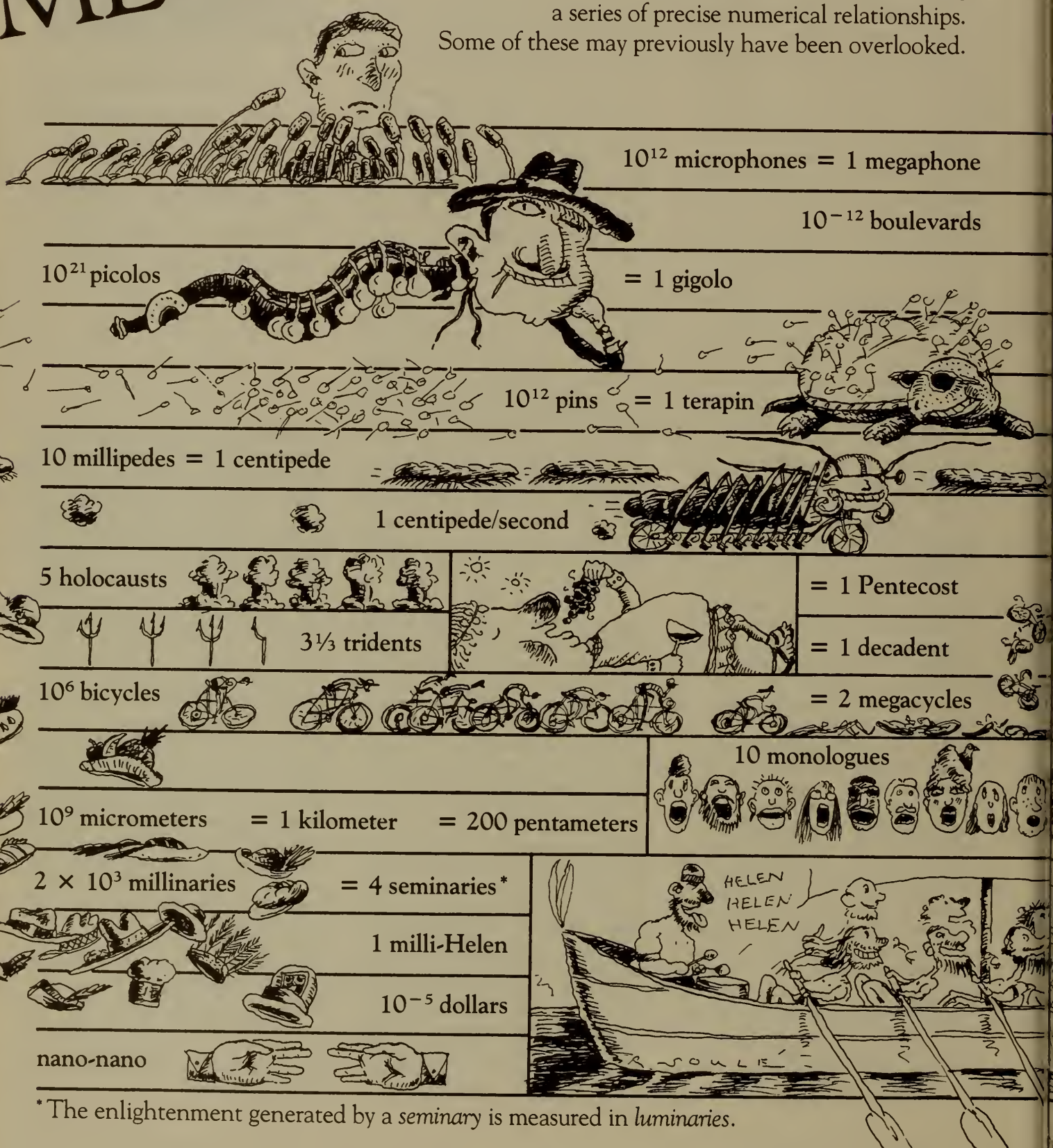
So does higher education.

Elise Hancock is editor of the Johns Hopkins Magazine.

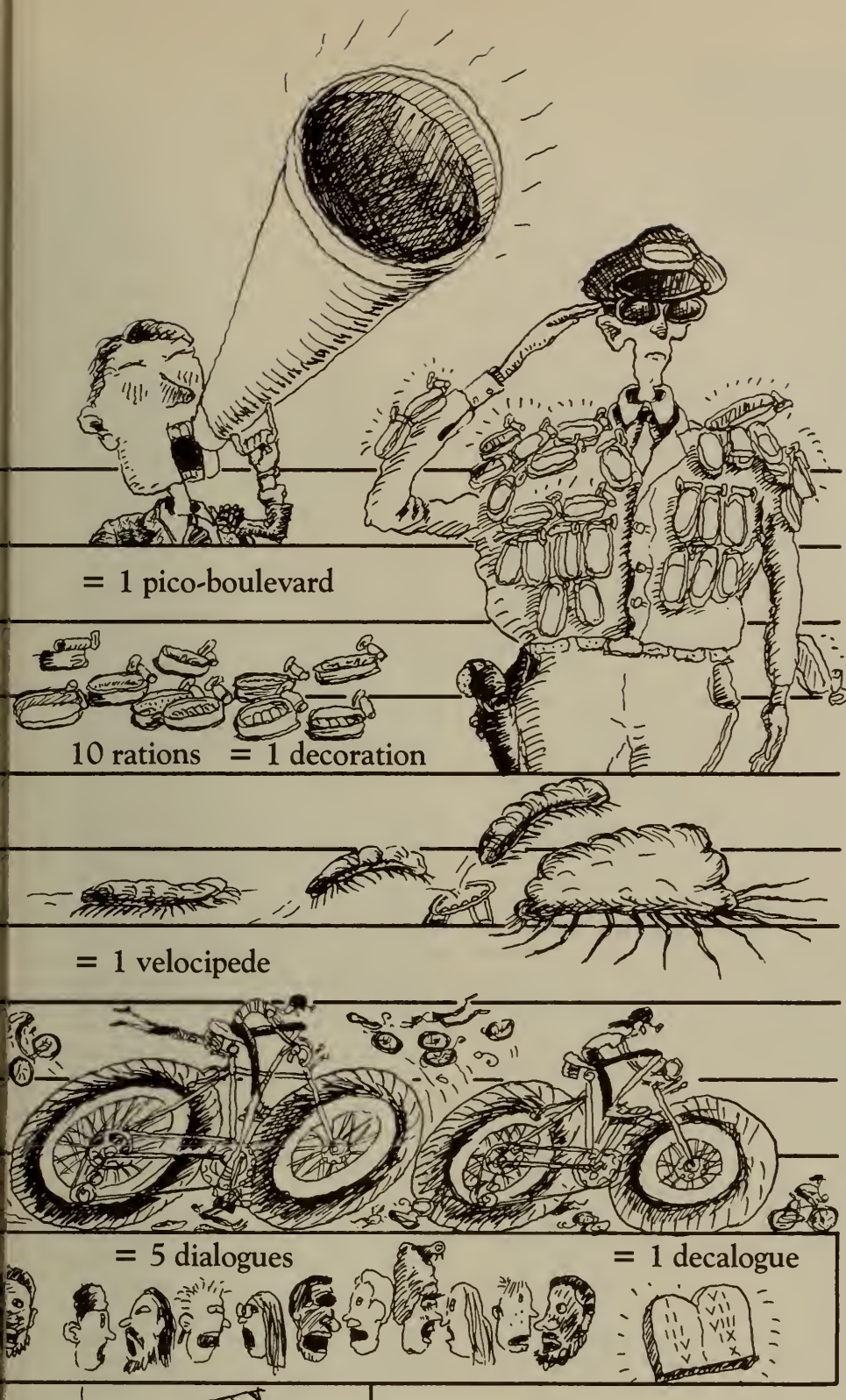
By Solomon W. Golomb

MEGAMEANINGS

Or, a new conversion table
for scientific units, indicating
a series of precise numerical relationships.
Some of these may previously have been overlooked.



*The enlightenment generated by a *seminary* is measured in *luminaries*.



Readers are invited to send in their own proposed conversions, which will be published in a later issue. Please write before October 15.

To jog your memory, Solomon W. Golomb has prepared a table of the standardized prefixes corresponding to scale factor changes by powers of ten:

$10 = 10^{1}$ = deca-

$100 = 10^{2}$ = hecta-

$1{,}000 = 10^{3}$ = kilo-

$1{,}000{,}000 = 10^{6}$ = mega-

$1{,}000{,}000{,}000 = 10^{9}$ = giga-

$1{,}000{,}000{,}000{,}000 = 10^{12}$ = tera-

$\frac{1}{10} = 10^{-1}$ = deci-

$\frac{1}{100} = 10^{-2}$ = centi-

$\frac{1}{1{,}000} = 10^{-3}$ = milli-

$\frac{1}{1{,}000{,}000} = 10^{-6}$ = micro-

$\frac{1}{1{,}000{,}000{,}000} = 10^{-9}$ = nano-

$\frac{1}{1{,}000{,}000{,}000{,}000} = 10^{-12}$ = pico-

In addition, there are well-established prefixes for the factors from 1 to 9, based on both Latin and Greek roots:

1	= uni-	OR mono-	OR holo-
2	= bi-	OR di-	OR diplo-
3	= ter-	OR tri-	
4	= quadri-	OR tetra-	
5	= quinto-	OR penta-	
6	= sexa-	OR hexa-	
7	= septa-	OR hepta-	
8	= octa-	OR okta-	
9	= nona-	OR ennea-	

Other factors for which there are agreed prefixes include:

½	= semi-	OR hemi-	OR demi-
3/2	= sesqui-		
11	= undeca-	OR hendeca-	
12	= dodeca-		
13	= triskaideca-		
20	= icosa-		

Solomon W. Golomb is professor of electrical engineering and mathematics at the University of Southern California, where his primary area of interest is communication engineering—information theory and coding theory. A writer of palindromes, he has also written of an analogy he discovered between quark theory and Rubik's cube.

Once, doctors prescribed crocodile dung, fly specks, and eunuch fat: patients came back for more, because they wound up feeling better.

I'm the doctor and you're the patient: I tell you I'm giving you something to make you feel better. You take it and, sure enough, you do feel better. Yet there's nothing in what I gave you to account for it. Maybe it's an injection of salt solution, which can relieve severe surgical pain by no physiological mechanism known to medical science. Or a sugar pill, which logically, pharmacologically, or any other way can have no effect, for good or ill, on the common cold. But it does anyhow: That's the placebo effect.

In his famous 1955 review of 15 placebo studies, which involved 1,082 patients suffering from conditions that ranged from headache and seasickness to wound pain and the common cold, pioneer placebo researcher Henry K. Beecher found that placebos worked about one third of the time, or to use the precise figure cited frequently since, "35.2 plus or minus 2.2 percent."

Consider this: A research team at the University of California at San Francisco (Jon D. Levine, Howard L. Fields, and two others) in 1980 reported that, on average, a placebo packed the pharmacological punch of a four to six milligram dose of morphine in treating the pain of tooth extractions.

Or this: In a clinical trial during the early 1960s, surgeons tied off certain arteries of patients suffering from anginal pain. The idea was to improve circulation to the heart. It worked, or seemed to; patients reported at least 60 percent relief from pain. But this pleasing result was tainted when mock "operations" in which the skin of patients was cut, leaving a scar, while internal organs were left untouched—an experimental control involving a form of placebo surgery not apt to be condoned today—achieved almost identical results.

A placebo's effects needn't be beneficial: Placebos have been found to elicit side effects ranging from headache and drowsiness to nausea and a "warm glow," just like pharmacologically active drugs. And they can be addictive: In one famous case, colored pills—a "new major tranquilizer," she was told—were given to a 44-year-old schizophrenic woman. They did help relieve her headache, insomnia, and anxiety. But after a while, she started doubling and redoubling her dosage. Pretty soon she was taking 25 tablets a day and couldn't stop without psychiatric help.

But by and large, placebos do leave patients suffering less. In one 1965 study conducted at Johns Hopkins Hospital by Lino Covi and Lee C. Park, both now associate professors of psychiatry, 14 out of 15 patients declared that the inert pink pills they'd been given to treat their neurotic symptoms had helped. In fact, four of the 15 rated them "the most effective ever prescribed for them"—although they'd been *told* they were receiving sugar pills. In at least one instance, a placebo effect has even reversed the effects of an active drug: When, in the early 1950s, a pregnant woman in a New York hospital complained of nausea, her physician, Stewart Wolf, gave her a drug he assured her would cure it. Sure enough, the nausea disappeared. The medicine he'd given her? Ipecac, normally given to *induce* vomiting.

Like other medicines, a placebo may or may not work; the "placebo effect" is what happens when it does. It may be prescribed to actually help the patient. Or it may be used as a control in the clinical trial of some drug or treatment. It may be a small green pill, or a big impressive red capsule; size, shape, and color don't seem to matter. It may be an injection. It may be superficial surgery whose only effect is to leave a scar. It may succeed in lowering the pulse, or causing gastric juices to secrete, or easing depression, or reducing pain. It is, in short, the form of treatment without its substance; yet it can achieve substantive results.

Placebos work on some of the people some of the time, but not on all the people all the time. Is there one kind of person who responds to placebos and another who doesn't? Is there, in short, such a thing as a "placebo reactor"?

Though students of the subject disagree, the more widespread view these days is that there is not. The fact is, some studies find that females respond to placebos more than do men, others the reverse. Some studies find correlations with IQ, while others do not. And many people respond to placebos at one time but not another.

There are, however, certain paradoxical consistencies about the *situations* in which placebos tend to work. First, placebos are clearly more effective in easing clinical pain than experimentally induced pain—by one crude measure about twice as effective, according to Michael Jospe in *The Placebo Effect in Healing*.

Magic Medicine:

"The doctor gave me something. Now I feel better."

Second, placebos work better on severe pain than they do on mild pain: In one study by Beecher, a placebo was only 29 percent as effective as a standard dose of morphine on patients with "mild" pain, but 77 percent as effective on patients with "very severe pain."

Finally, there is "the Anzio effect": Soldiers badly wounded on the beachhead at Anzio, one of World War II's bloodiest battles, and removed to rear positions for care, complained far less often of pain than do typical hospital patients recovering from surgery. Placebo pioneer Beecher, who first took note of the discrepancy, found that less than a third of the wounded soldiers complained of enough pain to require morphine. But morphine was needed by four out of five civilians recovering from analogous wounds incurred in surgery.

What to make of it all? The interpretation fashioned by Beecher, and now widely accepted, is that pain has two distinct components. One is associated with the original source of the pain. The other factor superimposes on the sensation itself the patient's fears, anxieties, and ignorance about his situation. GIs pulled to safety at Anzio were relieved at having survived the battle and now perhaps being on their way home, thus easing their pain. Surgery patients on the other hand, plucked from home and family and subjected to a hospital ordeal, generally feel a heightened anxiety. The anxiety compounds their pain.

Likewise, the kinds of experimental pain inflicted on willing subjects, through electrical shock and other controlled means, mostly lack that secondary component of pain that intensifies suffering: They carry no ambiguity and fear. That holds for mild pain of any sort, like that from a scratched thumb. Its victim is apt to be aware of the pain, yet not concerned.

It's this second component of pain, then, that the placebo is thought to reduce. Acting not upon the wound itself, but rather easing the patient's emotions about it, it lessens its perceived intensity. This "cognitive" dimension is what NIH researcher Ronald Dubner also comes back to in trying to explain the placebo's salutary effects—not just on pain but on all manner of physiological and psychological conditions. "The meaning of the pain changes because you get a placebo," he says. "What you're altering is not the intensity of the sensation but the relative unpleasantness of the situation as a whole.

"Since it doesn't do anything, it won't be easy to get people to take it every day. There's just no demand for a preventative placebo."

The Placebo

by Robert Kanigel

"Find out who set up this experiment. It seems that half of the patients were given a placebo, and the other half were given a different placebo."

The placebo alters the meaning of the experience: 'The doc gave me something; now I feel better.'"

Once, of course, placebos were virtually the only treatment physicians prescribed. Once, before CAT scans and penicillin, doctors prescribed crocodile dung, teeth of swine, fly specks, oil of ants, fur, feathers, and eunuch fat. They purged their patients, punctured them, blistered them, bled them, froze them, and shocked them. Remarkably, patients kept coming back for more. Came back because they wound up feeling better. Came back for something in those few moments with witch doctor, faith healer, or physician, something in his healing touch, that left them better off—freer of symptoms, further from death—than they'd been before.

"Today we know," writes veteran placebo researcher Arthur K. Shapiro of Mount Sinai Hospital in New York, "that the effectiveness of those procedures and medications was due to psychological factors often referred to as the placebo effect. Since almost all medicines were until recently placebos, the history of medical treatment can be characterized largely as the history of the placebo effect."

But then along came modern medicine: Antibiotics do not depend for their potency on the personality of the physician administering them, or the kindness he shows, or the ritual setting in which he renders treatment. The old remedies, meanwhile, which worked only some of the time and in mysterious ways, were by and large discarded. And the placebo effect itself, whose potency had masked their ineffectiveness? As if guilty by association with crocodile dung and bleeding cups, it came to be "considered merely as a variable to be controlled," as one revisionist commentary in the *Journal of the American Medical Association* noted in 1975, and so "ignored."

Coming from Latin, the word placebo translates as "I shall please." After the Middle Ages it came to mean a servile flatterer, sycophant, or toady. By 1811—it appeared that year in *Hooper's Medical Dictionary*—it was being used about as it is today, complete with faintly unsavory aroma, as an "epithet given to any medicine adapted more to please than benefit the patient."

Contempt dogged the subject, and in some quarters still does. Around the turn of the century, the eminent Harvard medical ethicist and physician Richard C. Cabot observed that "No patient whose language you can speak, whose mind you can approach, needs a placebo. I give placebos now and then . . . to Armenians and others with whom I cannot communicate." A more recent commentator lamented that "some patients are so unintelligent, neurotic, and inadequate as to be incurable, and life is made easier for them by a placebo."

In keeping with these attitudes, it is only in the last 35 years or so that the placebo effect has been studied as a phenomenon all its own. As Hopkins pharmacologist Paul Talalay observes, "The major textbooks of medicine don't even mention the subject"—although, as he says, the placebo "confounds every transaction between the physician and patient."

"Most physicians tend to disbelieve the magnitude of it," says Talalay, and are uncomfortable with the subject. "It undermines a doctor's confidence in the effectiveness of his treatment. We're not comfortable with the idea that much of the time what we're doing has no therapeutic basis . . . . It makes us edgy. I suppose it's because the placebo is the meeting ground between the physician and the charlatan."

Psychiatrist Jerome Frank of Hopkins likes to speak to "the faith that heals." That was the title of an address he gave a group of medical school graduates in 1975 in which he outlined how Christian Scientists, acupuncturists, yoga masters, and the like view illness and health. All such non-medical healers, he observed, see health "as a state of harmonious integration of the person with himself, and with his society, nature, and the cosmos." Illness represents a disruption of this harmony, and "the task of the healer is to restore the disrupted harmony," mobilizing the patient's faith

And mobilizing the patient's faith, argued Frank, is part of what happens every day in every hospital, right alongside the

"I give placebos . . ." said medical ethicist Richard C. Cabot, "to Armenians and others with whom I cannot communicate."

surgery and the drugs. "One need only substitute Science for the supernatural healing powers invoked at faith-healing shrines to discover striking similarities," Frank told his Commencement Day listeners. At a hospital, which enjoys "an immense reputation as a site of amazing cures," physicians "perform arcane rituals." Their labs and operating rooms and intensive care units are places to "which they alone have access." They employ "spectacular machines that beep and gurgle and flash lights or emit immensely powerful but invisible rays." From time to time they perform "a dramatic, expensive, and impressive operation in which the surgeon stops the patient's heart, repairs it and starts it up again. The surgeon literally kills the patient and then resurrects him. Few faith healers can make an equally impressive demonstration of healing power."

A patient typically comes to every encounter with his physician, says Frank, with an attitude of " 'Oh, he must have very powerful medicine,' which is the equivalent of 'Oh, he has powerful magic.' " This "magic," and the patient's belief in its power, are the basis of the placebo effect.

Frank concludes, "History has shown that faith healing works, and the placebo is an attenuated form of it . . . Faith healing conjures up witchcraft and all sorts of quackery," he admits. but what the modern physician does, through the placebo effect, is simply "smuggle it in through the back door."

"As the doctor-patient relationship is rediscovered as a worthy focus for medical research and medical education," writes Howard Brody of Michigan State University in a recent issue of the *Annals of Internal Medicine*, "the placebo effect assumes center stage as one approach to a more sophisticated understanding of this relationship." It is not the medical expertise the doctor can bring to bear that counts most heavily here, but the *doctor in person*, and the kindness, caring, and warmth that are offered—or not offered.

Consider this study from the mid-1960s: Two matched groups of patients facing abdominal surgery got differing styles of care. One had the anesthesiologist in to tell them about the coming operation but heard nothing about any postoperative pain they might face. The other group got special treatment: The anesthesiologist spent much more time with them, discussed the nature and severity of the pain they were likely to experience, and reassured them that backup medication was available from the nursing staff. As it turned out, those in the more sympathetically treated group needed only half the pain medication, and were discharged from the hospital an average of two days earlier, than members of the other group. "A placebo effect without the placebo," was how the investigators put it (L. D. Egbert, G. E. Battit, C. E. Welch, and M. K. Bartlett, *New England Journal of Medicine*). What it amounted to, though, was caring and respect for the patients as people.

This and other studies yielding similar results moved Herbert Benson and Mark D. Epstein to lament, in a commentary in the *Journal of the American Medical Association* entitled "The Placebo Effect: A Neglected Asset in the Care of Patients," "the growing trend toward decreasing doctor-patient contact, for example through the use of computer facilities to obtain histories." Benson has elsewhere been quoted as saying that "the most important thing a doctor can do in terms of dispensing care is simply to *care* about the patient. And establishing rap-

"Well, I went to medical school overseas, and for your type of low-back pain, we sprinkle dried roots on the ground, then chant for ten minutes."

"It makes us edgy," says pharmacologist Paul Talalay. "I suppose because the placebo is the meeting ground between physician and charlatan."

port is the real basis for the placebo effect."

To what can be traced the physician's healing influence? Until 40 years ago, of course, very often all a physician could do was diagnose, laying out the likely course of an illness and informing the patient what he would face. *And this actually helped.* In an insight Jerome Frank credits to a Hopkins colleague, Paul R. McHugh, those early physicians were at least addressing the awful ambiguity a sick patient feels about his condition, and ambiguity is, as Frank notes, "one of the greatest sources of anxiety." Anxiety, in turn—as Henry K. Beecher, with his two-level pain model 30 years ago surmised—tends to aggravate the pain the patient actually perceives. Thus a doctor who "offers clear, concise, unambiguous treatment immediately reduces anxiety," says Frank, and so, in many cases, the patient's suffering as well.

But the physician's healing influence is hardly cut and dried. "Between the doctor and the patient's getting better there may be 50 complicated variables that affect one another," says medical psychologist Michael Jospe; medicine is an art as well as a science and, like any art, some practitioners may be better at it than others. Whether physicians differ innately in their ability to heal is, as Jerome Frank says, an "awkward question." But Michael Jospe plainly thinks so. "Some doctors are better healers than others," he says, and the differences lie in their personalities, in the intuition, the calming influence they bring to their dealings with patients.

Is this, then, what faith healers and other "primitive" practitioners offer? "Oh, yes," Jospe replies. "We only say it's 'primitive' because it's so complex we don't know how to deal with it."

As to the placebo itself, though, there is one intriguing lead on a possible physiological mechanism, discovered in California a few years ago. Jon Levine's research team at the University of California at San Francisco gave first placebos, then intravenous naloxone, to patients recovering from surgery for tooth extraction: the naloxone cancelled any placebo effects they'd experienced. The article was published in *Nature*, Britain's pre-eminent journal, and created international excitement among researchers in the life sciences.

Naloxone is an "opiate antagonist": Often used in helping addicts detoxify, it locks onto the same receptor sites in the brain at which endorphins hook up (the brain's natural opiates), thus blocking their pain-killing action. Therefore, if an injection of naloxone blocks the placebo's analgesic effect in patients who had been relieved by it, perhaps the placebo effect works through the endorphin system.

Years before, in 1965, Louis Lasagna had commented on the "curious hyperalgesic [pain-heightening] effect" of naloxone on patients with post-operative pain, but couldn't explain it. Now here, maybe, lay the explanation: The placebo marshals the body's natural pain-killing system—which the naloxone disrupted, thus exacerbating pain.

Maybe. Recent studies at the National Institutes of Health seem to lend another interpretation to the California results. Just as in Levine's work, says Ronald Dubner (chief of neurobiology and anesthesiology at the National Institute of Dental Research), dental patients in his studies reported greater pain when they got naloxone. But so did patients who got *no* placebo.

In their still-unpublished experiment, the results of which were presented to the annual meeting of the Society for Neuroscience last November, Dubner, research psychologist Richard Gracely, and their colleagues, established a "no-treatment" group that got neither pain-killer nor naloxone. Yet the pain level in this group shot up the same amount when it got naloxone as did the placebo group's pain. In other words, the results can be explained without the placebo. Perhaps, says Dubner, it was simply "the stress of surgery" that activated the endorphin system, not the placebo at all.

But the endorphin placebo hypothesis is by no means a closed book. "The placebo is not the only thing in the world that turns on the endorphin system," says Levine. Why should the pain increase in the NIH no-treatment group be surprising? His group is repeating the experiment—with a no-treatment group—but with different pain levels. He hopes to resolve the discrepancies between his group's results and those at NIH.

But even if endorphins or related mechanisms should come to explain certain aspects of placebo action, that leaves wide open the intriguing fundamental question of how symbolic input—a thought or an emotion—can release endorphins, or for that matter other neurotransmitters. Then, too, the endorphin hypothesis would seem to apply only to the placebo's pain-killing powers, not to its capability to bring relief in other ways. So, despite the promise of the endorphin work, a neat physiological explanation for the placebo effect is still a long way off. "Most likely," as Paul Talalay says, "the placebo effect is like cancer—a whole series of different things that operate through a variety of different mechanisms."

Afterword: A few years ago, the *Journal of the American Medical Association* reprinted an old piece from its June 23, 1900 issue in which one W. W. Keen, MD, LLD, outlined what he saw as the characteristics of "The Ideal Physician." At times of "sickness and weariness and woe," Keen wrote in the overwrought prose of that era, the physician is a welcome visitor indeed: "Then can his gentle touch give assurance; then can his sympathetic voice bring hope; then can the thousand and one acts of thoughtful kindness bind to him for life the anxious hearts looking to him as the messenger of life. Even in the daily routine of a hospital clinic," he wrote in the first year of the twentieth century, "a kind word is often better than any medicine."

ALUMNI PROFILES

Steve Donahue, '29: 45 Years of Service to His Alma Mater

Stephen D. Donahue, '29, retired recently—for the third time—from a temporary job he took 45 years ago. That's how long Steve served as manager of the WPI news bureau.

Steve's plans for a career in chemical engineering were dashed, as were the plans of many, in the Great Depression. Luckier than many in those days, Steve did find a job working as a reporter for the Worcester *Evening Gazette*. When the late Alumni Secretary Herbert F. Taylor began thinking about establishing a WPI news bureau in 1938, Steve was the person he turned to for advice on how it should be done.

Then he asked Steve if he would be willing to act as manager until someone could be found. When no suitable candidate was found, Taylor convinced Steve to take the job on a permanent basis.

Steve had been on the job but a few days when the infamous 1938 hurricane swept unannounced through New England. In its rampage, the storm toppled scores of shade trees which had lined the campus walks. Steve had pictures taken of WPI's football team in their practice uniforms getting into shape for the season by cutting up the downed trees. These pictures were published all over the country. If there had ever been any doubt about what an alert newsman could do for WPI, Steve's work squelched it.

From the beginning, he established definite standards for WPI news releases. They had to be accurate and timely, sent to all interested news media, and written in the accepted style of the intended audience. He never deviated from these standards. As a result, WPI began to achieve greater recognition throughout the region.

The initial success of the WPI news bureau, the first in the city, soon brought inquiries from Holy Cross and Clark University. In typical Steve Donahue style, he shared his experiences with those picked to start news bureaus across town. Because Steve and his early colleagues set and maintained high standards, today's relationships between the educational institutions and the local news media are probably second to no other college community's in the country.

John F. Wellsman

Donahue: Worcester's first public relations professional.

During World War II, Steve accepted a commission in the Army Air Corps and served nearly four years as a public relations and public information officer with the Second Air Force. He returned home a major and began a second part-time career as an Air Force Reserve officer. His old job as a reporter was not waiting for him at the *Gazette*. Instead, the newspaper promoted him to city editor. He also went back to his part-time job at WPI's news bureau.

Part of his *Gazette* job was to train new reporters. Many Donahue-trained newsmen have gone on to some of the nation's major newspapers. In recalling his days as a fledgling reporter, for example, Edwin Dale of the New York *Times* reflected on his fondest memories of his brief stay in Worcester, "... my first paycheck ... my first by-line ... the sheer competence of my first city editor, Steve Donahue of the *Evening Gazette*."

Today, whenever I meet one of these news writers who began in Worcester, the first question is "How's Steve Donahue?" I know what a great teacher he was, too, because in my early days in public relations at Norton Company, Steve would take the time to criticize constructively the releases I brought in for publication. Little did I know then that Steve and I would later work together at WPI for 19 years.

In 1976, the Worcester County Public Relations Association honored Steve as Worcester's first public relations professional.

Steve and his wife, Frances, have two sons. Steve, Jr., known at home as "Jay," graduated from WPI in 1963, earned a master's degree at MIT and has been a Procter & Gamble executive for many years. Michael is a Holy Cross graduate who earned his doctorate at Boston University and is now at Brandeis University as a member of the counselling staff.

Steve is an expert on classical jazz. His collection of old records includes those of many of the musical greats of an earlier time.

Steve retired for the first time in the mid-sixties as a reserve officer. He retired as a colonel in the Air Force, a rank few reservists ever achieve. He retired the second time in 1973 from the *Evening Gazette*.

When Steve passed WPI's normal retirement age, he stayed on as a consultant, and his daily schedule never changed, nor did the fine work he produced.

Steve types newspaper style—with two fingers. That's how he produced between two and three hundred news releases for WPI each year. Those two fingers provided a chronological history of the important events at this college for 45 years, a contribution of unparalleled value, matched only by his professionalism and his dedication to his alma mater.

By Roger N. Perry, Jr., '45
Director of Public Relations

WPI CLASS NOTES

WPI Alumni Association
President, Harry W. Tenney, Jr., '56
Senior Vice President, Donald E. Ross, '54
Vice President, Paul W. Bayliss, '60
Secretary-Treasurer, Stephen J. Hebert, '66
Past President, Peter H. Horstmann, '55

Executive Committee Members-at-Large
Henry P. Allessio, '61; Walter J. Bank, '46; William J. Firla, Jr., '60; John M. McHugh, '56.

Alumni Fund Board
Edwin B. Coghlin, Jr., '56; Richard A. Davis, '53; Gerald T. Dyer, '56; Gerald Finkle, '57; Allen H. Levesque, '59; C. John Lindegren, '39; Philip H. Puddington, '59; George P. Strom, '56.

1916

A profile of **Carroll Merriam** of Waterville, ME, appeared in the December issue of the *ACSM Bulletin*. Mr. Merriam is a past president and honorary member of ACSM. Last August he served as advisor to TV's "Good Morning America" on the segment titled "Where Does the Sun First Touch the United States?"

1917

Herb Kelly, 87, is the oldest active player at the Redland Golf and Country Club in Homestead, FL. Last year his game was in the low 90s, and this year he still breaks 100.

1921

The **Robert Chapmans** enjoyed spending the winter in Sarasota, FL. Not only do they have three grandchildren at WPI, their granddaughter Susan is coordinator of women's athletics.

1924

Since retiring from New England Power Co., Shelburne Falls, MA, in 1966, **Harry Hurd** has become a lapidary. He enjoys cutting, grinding and polishing semiprecious stones, and setting them in pins and lockets.

1930

Roscoe Bowers writes that he and Ruth have moved from Clearwater, FL, to 363 Longwood Drive, Venice, FL. Ros. has been playing some golf and making bookcases at home, and he is looking forward to a possible trip to New England this fall.

A photo of **Ed Delano** taken before the start of last year's Veterans World Cup bicycle race in Austria was featured in the April issue of the *AARP News Bulletin*. This year Ed plans to enter several U.S. races. The two Delano daughters are teachers. Son Ed, also a racing cyclist, is a supervising highway construction engineer for the state of California.

Charlie Fay, a patent attorney, has closed his Worcester office and is currently operating from his home in Sterling, MA. His son, Dick, a professor at Loyola, is a co-author of *Hot Dog Chicago*, a paperback book describing 150 fast-food places in the Chicago area.

Mr. and Mrs. **Christos Orphanides** celebrated their 50th wedding anniversary in February at a party hosted by their son and daughter in New London, CT. Both came to the U.S. from Greece in the 1920s. She attended Wellesley College. During World War II, Orphanides served as a lieutenant commander with the Navy Air Corps. He retired in 1974 from Enterprise Electric Co., a company he founded in 1945.

Don Simonds, who retired as vice president from Beloit (WI) Corp. in 1974, currently serves on the board of the Sigurd Olson Environmental Institute at Northland College. He is concerned with Department of Natural Resources activities as they affect fishing. The Simondses recently celebrated their 46th wedding anniversary.

Charlie Wright says that his only complaint is that he and Alice don't see as much of their grandchildren as they'd like. They have three grandsons and two granddaughters.

50th Reunion of WPI '33

The class of '33 came back for its 50th in force, and each of us was provided with a full measure of enjoyment at a SUPER reunion.

Thursday evening we enjoyed the warm hospitality of President Ed and Virginia Cranch for a most enjoyable reception at their lovely home, followed by a roast beef dinner at the Higgins House. There our "Prexy" told us of WPI's plans for the future and then touched upon the past by awarding each of us a "diploma" for 50 years of service and loyalty to our Alma Mater. Returning to the Sheraton-Lincoln Inn, we found Room 224 a place of warm hospitality and we renewed friendships.

Friday was a day for many and varied activities, both on and away from campus. We had fifteen golfers on—and off—the fairways of the Worcester Country Club. A special, eye-opening campus tour was conducted by Alumni Secretary Steve Hebert, and classmates who had not been back to WPI for some time were amazed to find the significant changes that had taken place.

By late afternoon we were reassembling in our Hospitality Room, keeping our bartenders John Dwyer, Bob Ferguson and Warren Saltmarsh busy. Then came the BIG BANQUET, a lively and colorful affair, much of which was recorded by our "unofficial" photographer, Norm Clark. Jerry Vail's excellent toastmastering enhanced the program, highlighted by special guest Professor Art Gerstenfeld, who told us about automation and its effect on society. Later, many of us took the microphone to offer anecdotes of our student days at Tech.

Sumner Sweetser presided over an election of the following officers: George Lyman, President; Ed Johnson, Vice President; Al Brownlee, Secretary; and Tom Decker, Auditor. Continuing in office are: Ed Allen, Treasurer; and Bill Anderson, Historian.

Saturday found us taking part in activities on campus, including a meeting of 50 Year Associates. Then, preceded by music from the Bagpipe Band, we enjoyed the biggest-ever Annual Reunion Luncheon in Harrington auditorium. Our class won the Class of '17 Cup for the largest percentage of living members present, accepted by Reunion Chairman George Lyman. Ed Johnson presented President Cranch with our class gift, which comprised the generosity of 81 percent of our class members. The donation is represented by a large classroom and adjacent conference room in the renovated Washburn Shops.

With the luncheon over, our class said their good-byes and prepared to leave for home. We had ample reason to reflect and to be proud. Most of us, graduating in the depths of the Great Depression, could make only slow and modest starts, but we subsequently ended up with astonishingly diverse, yet meaningful and productive careers. As classmates from '33, we can truly say that we "earned our living" all the way—and had a lot of fun in the process.

Al Brownlee, Class Secretary

Dan O'Grady and **Carl Backstrom** are planning a Class of 1930 golf tournament in the fall, probably at the Woods Hole Country Club on the Cape. Anybody care to join us?

Carl W. Backstrom, Class Secretary

1931

Elsie and **Richard Fairbanks** celebrated their 50th wedding anniversary at the family home in Rutland, MA, on January 1. A former nurse, she graduated from Hahnemann Hospital School of Nursing, Worcester. Before his retirement, Fairbanks was an aeronautical expert with the federal government.

1932

Dr. **Fred Bickford** has been named the 1983 Eugene C. Sullivan Award recipient. The award, established by the Corning Section of the American Chemical Society, recognizes, among other things, meritorious achievement in research. Dr. Bickford is credited with key development work on the fused-silica process that has produced mirrors for space and has become the cornerstone of optical waveguide technology. He retired in 1974 as manager of specialty ceramics research in Corning's Research and Development Division.

1934

John Birch, who had been hospitalized following a heart attack, now serves as a photographer for the Sunny Hills (FL) Fire Department, which he founded. A volunteer in six organizations, he also helped set up the local Presbyterian Church.

Bill Burpee writes that since retiring from the Badger Co. in 1979, he has been spending summers gardening and golfing in Reading, MA, and winters golfing and loafing in Naples, FL.

Last April **Carl Hammarstrom** presented a paper on Improving Right-of-Way Surveys and Records at the ASCE Specialty Conference in San Antonio. The National Society of Professional Surveyors (NSPS) honored Carl for his contributions as area director at the 1983 convention of NSPS in Washington, DC.

Ray Sjostedt, after leaving plastics and Civil Preparedness for the state of Connecticut, got involved in Advertising Specialties part time. He and Peg spent the last two winters in New Mexico, where Ray took lessons in painting from a University of New Mexico art teacher. "Looking forward to our 50th!"

Everett Sellew serves as treasurer of his church and of the local branch of the American Red Cross. Recently he took up golf, but his favorite activity is working in the yard.

Howard Whittum is doing some consulting work and research on crime prevention and aluminum neurotoxicity. He recently finished his second year as president of the Tech Old-Timers Club. "Come and visit us when you're in Worcester. We meet the second Thursday of the month, September through May, at 9:30 a.m. in WPI's Gordon Library."

Howard A. Whittum, Class Secretary

40th Reunion of WPI '43

Who says you can't turn back the clock? Not the 29 couples and seven singles who came back for our 40th reunion. The air was full of fond memories for three days as 65 people thoroughly enjoyed the festivities.

The events started at Friday evening's reception at the home of President Edmund and Virginia Cranch, who welcomed us back to the campus. Then it was on to the Higgins House for a good old New England clambake with tasty steamers and succulent lobsters. Then off to the Goats Head Pub in the old Sanford Riley Commons Room for beer and dancing to a lively banjo band.

Those who stayed at the Marriott will never forget the eight to ten false fire alarms which sounded until the wee hours of Friday morning. Screaming loudspeakers, shrill sirens and roaring fire trucks kept us hopping.

Our hospitality suite at the Marriott almost never stopped entertaining. Friends came and went—but mostly stayed and kept the conversation full of "remember whens." We were indeed fortunate to have Mal and Helen Walker as host and hostess, for they arranged a well-stocked facility and saw that it operated properly as the focal point of our activities.

At the Reunion Luncheon on Saturday our Gift Chairman Pete Lindsay requested that our bountiful gift be used to refurbish some part of the Washburn Shops, which are now undergoing complete refurbishing and expansion. We were also proud to observe that three of the five award recipients were from '43. Bailey Norton and Earl Page each received a Goddard Award for excellence in professional achievement and Ed Campbell received the Taylor Award for distinguished service to WPI.

The Tatnuck Country Club was a beautiful setting for cocktails, dinner and dancing on Saturday evening. Jim Donahue, '44, Trustee of the college, was our guest and speaker. In his inimitable style he gave us one belly laugh after another with his stories and community singing.

Sunday morning and continental breakfast at the Marriott hospitality area arrived all too soon. With much hugging and kissing we told our final stories, showed once more our grandchildren's pictures, took photos and said our fond farewells. Our sincere thanks go to Bob Bierweiler and his Reunion Committee, for 36 grads and 29 wives just can't wait until the 45th.

Ed Campbell, Reunion Secretary

1935

Wesley Proctor, formerly of Chatham, MA, has moved to Woodlawn Lakes, Lake Drive, Palmetto, FL.

1936

George Rocheford said in February, "Am winding up my last year as head agent of our class." He and Laura have moved from South Natick. Currently they reside at 39 Colton Lane, Shrewsbury, MA 01545.

1938

Last year Dr. **Gilbert Ashwell,** chief of the biochemistry laboratory at the National Institute of Arthritis, Bethesda, MD, received a foundation award of $15,000 for "outstanding achievement in the field of medical science."

1939

Last year the **John Peaveys** took their first trip to Europe with a garden group. He writes: "Enjoying life in the Blue Ridge Mts. Growing azaleas and rhododendrons from seeds and cuttings."

1940

Albert Howell has retired after 38 years with Mack Trucks. He worked in the test laboratory and was concerned with bus design, off-highway design and chassis design analysis. For four years he was also associated with Chrysler's advance engineering department.

Fritz Johanson retired last year from Warner & Swasey Co., Worcester.

Norman Laliberte, now retired as senior research chemist from American Optical Co. (AO), says that tennis has replaced track as his current activity. At AO he was instrumental in the development of the RX plastic lens.

1941

Sidney Clark has retired as chief engineer with Aetna Steel Company after 41 years of continuous service.

Norman Klaucke writes that he enjoys winters on Hutchinson Island, Jensen Beach, FL. "Fishing, swimming and golfing just great."

1942

In March **Rodney Paige** retired as vice president of engineering at Pfizer, Inc., following 32 years of service.

1943

The director of pre-print systems for the Graphic Communications Association (GCA) in 1976–77, **William Tunnicliffe** was recently named as vice president of information technologies for the firm. One of his responsibilities is furthering the development of GCA GenCode.

1944

Louis Baldini, a registered engineer, holds the post of vice president and chief design engineer of the Electrical Group at I.C. Thomasson & Associates, Inc., Consulting Engineers, in Tennessee. He joined the firm in 1960, following 16 years with Westinghouse, the Kellex Corporation and several electrical contracting firms.

1945

Dr. **Joseph Carrabino** continues as a faculty member in the business school at UCLA. He also does consulting work with Litton.

Prof. **Owen Kennedy** has been named associate head of the WPI Electrical Engineering Department.

Dr. **Ernest Kretzmer** now works for ABI.

Robert Lotz recently retired from Printing Developments, Inc., Springdale, CT.

1946

George Comstock has been named chairman at Durango Systems, Inc.

William Grogan, dean of undergraduate studies at WPI, has been elected a fellow by the board of directors of IEEE.

Carlton Lutts is the editor of *The Cabot Market Letter,* which is published in Salem, MA. The publication discusses the hottest stocks and gives tips on when to buy and sell.

Cecil McCurry, no longer with Crown Zellerbach, is now self-employed as a consultant to the pulp and paper industry.

Edward Waranowicz has joined the architectural engineering firm of Hoyem-Basso Assoc., Inc., Troy, MI, as vice president and director of mechanical engineering. Previously, he was deputy group leader for Bechtel Power Group. A registered professional engineer, he is NCEE certified, as well.

1947

Jack Harding holds the post of vice president and chief scientist at Litton Data Systems in Van Nuys, CA. The division is involved in a five-year program to develop state-of-the-art Very Large Scale Integration (VLSI) technology.

1948

Charles Jones continues as president of NUS Corp., now located in Gaithersburg, MD.

Louis Katz is now assigned to the Netherlands NATO E-3A (AWACS) project.

Lynwood Lentell retired from Caltrans in July of 1982.

Jim McKernan, who recently left Du Pont after 33 years of service, is now a self-employed manufacturer's representative selling steel drums, plastic drums and chemical product containers.

Herb Slaughter Wins Kolk Award

For 37 years, Herbert Slaughter, Jr., '46, has been helping to make America's skyways safer. Last fall, he was awarded the prestigious Franklin W. Kolk Air Transportation Progress Award for his outstanding contributions in the field of air transportation. The award was presented at the Society of Automotive Engineers (SAE) Aerospace Congress & Exposition held in Anaheim, CA.

A manager for Sikorsky Aircraft in Stratford, CT, since 1976, Slaughter previously had been with the Federal Aviation Administration (FAA) for 27 years. During that period, he helped develop safety regulations and civil certification policy for all types of aircraft, including helicopters, jumbo jets and the SST. He also contributed much to the work of the SAE aerospace technical committees and to the Aerospace Council.

At the award presentation the Society cited Slaughter's professional advancement of air transportation and, particularly, his concern for the industry's safety aspects.

"Prior to joining the FAA," Slaughter says, "I held posts with Douglas Aircraft and Capital Airlines. I started out as a flight test engineer with the FAA. When I left in 1975, I was chief of all engineering services related to the certification and production of all civil aircraft, as well as engines, propellers and accessories."

In 1973 Slaughter represented the U.S. at the International Civil Aviation Organization, an adjunct of the UN, where he promoted U.S. safety standards as an international standard.

On the job at Sikorsky

Currently Slaughter is manager of Interfunctional Product Integrity at Sikorsky, where he is also responsible for civil certification and quality procedures. He is chairman of the Product Integrity Council.

A member of several professional societies, Slaughter has, in addition, been active with his local Little League and the YMCA. He belongs to Tau Beta Pi, Skull and Phi Sigma Kappa. He is a former vice president of the Washington (DC) chapter of the WPI Alumni Association.

1949

Formerly the assistant general manager for engineering at Electric Boat (EB), Groton, CT, **John Hunter** was recently named to the new post of assistant general manager for special projects. Hunter, who has been with EB for 34 years, belongs to the Society of Naval Architects and Marine Engineers and is a registered professional engineer in Connecticut.

1950

Last spring photographer **"Hank" Baker** and his artist wife, Marie, had an unusual joint art exhibit at the Hudson National Bank in Acton, MA. Last year Hank retired from his civilian job with the Army Corps of Engineers after a 30-year career in civil engineering.

Dan Harrington's company, Sunnyside Motor Co. of Holden, MA, has been awarded a distinguished achievement award by the Ford Motor Co. for the 31st consecutive year.

Russ Norris wrote "Weather-Proof Surface Coatings," which appeared in the January issue of *Building Operating Management.* He is a partner of Brodsky & Norris, Inc., of Ridgewood, NJ, a manufacturer's representative firm specializing in protective coating and construction products.

Philip Nyquist is a consultant on industrial safety and special projects for the Saudi Arabian Standards Organization in Riyadh.

1953

Henry Camosse, his parents and his sister toured Italy last summer, visiting Rome, Pisa and Venice. He continues with his concrete block and masonry supplies business in Worcester. Henry has two granddaughters and five grandsons and wonders if that's a class record.

George Crozier has been named a vice president by Monsanto, where he has worked since 1956. He serves as president of Leonard Construction Co., a wholly owned subsidiary of Monsanto near St. Louis, MO.

Dick Davis, a WPI trustee and president of CCi, Inc.. spoke on the topic "Small Computers—A Big Subject" at the March meeting of the Junior Women's Club in Waterford, CT.

Dr. **Charles Dechand** continues as a consulting physicist at Combustion Engineering in Windsor, CT. Two of the Dechand children are now in college.

David Holmes has been appointed vice president in charge of operations for the Perini International Corporation in Framingham, MA. Most recently he served as project manager for a Middle East air base construction project.

"Bud" Madigan is still the CEO of Worcester's F. W. Madigan, Inc. He is president of the Worcester General Building Contractors Association and a member of the Consulting Constructors' Council of America. In his spare time he continues to run several thousand miles a year.

O. B. McKnight continues as manager of domestic sales at Heald in Worcester. He also teaches engineering one night a week at Central New England College.

William Mears recently received a Technical Board Certificate of Appreciation during the 1983 Honors Convocation of the Society of Automotive Engineers (SAE). Bill, who is with Mobil's Automotive Lab., has made outstanding contributions to the SAE Passenger Car-Light Truck Fuel Economy Measurement Committee through his research on chassis dynamometers.

Ray Peterson, chief engineer for American Shoe Machinery in Woburn, MA, has been named associate editor of the "Puzzle Korner" of the *New England Engineering Journal.* He is a registered professional engineer, belongs to ASME and the Massachusetts Safety Council, and has an MSME from Northeastern University.

Paul Snyder holds a new Mobil post as manager of the refinery technical department with the Saudi Ministry of Petroleum and Minerals in Yanbu, Saudi Arabia. He is involved in the start-up of an export refinery, which is being carried out under a 50-50 Mobil and Saudi partnership.

"Stan" Stanton is with Scientific Atlanta in Phoenix, AZ. He has an accounting degree from Arizona State.

David Van Covern is president of his own firm, Carolina Industrial Equipment, Inc., in Charlotte, NC. The company is basically a manufacturer's representative for industrial plant vehicles and sweepers, although it does sell and service some products.

Seymour Vershon, formerly with Tenneco Chemicals, Inc., has been named director of finance by Gov. John Sununu of New Hampshire. He has an MBA from the Wharton School of the University of Pennsylvania.

David S. Jenney, Class Secretary

1954

Bill Hills is a VITA volunteer and lectures at local colleges on textile fibers and the engineering profession. His business, Hills R & D, Inc., in Melbourne, FL, manufactures synthetic fiber extruding machinery.

John Malloy, Jr., town administrator of Westfield, NJ, for the past 13 years, has received an award for career excellence given annually by the New Jersey Municipal Management Association.

Milton Meckler of the Meckler Group, Encino, CA, has been serving as adjunct professor of mechanical and chemical engineering at California State University at Northridge. In February he delivered a paper at the International Daylighting Conference in Phoenix, and he was recently elected vice president of the Encino Chamber of Commerce. He is listed in the fifth edition of *Who's Who in Engineering.*

Ed Power, who recently returned from a family reunion in France, is manager of General Foods' Guadala Harry's restaurant chain.

Frank Rybak of Artek Associates (consulting and design of opto-electronic systems) in Glen Arm, MD, says his firm is involved with microprocessors in products for traffic control and architectural use.

Roger Wildt has been named assistant manager of Bethlehem Steel Corporation's sales engineering division for the steel group. Previously he was project manager of the division. Before joining Bethlehem in 1960, he was an associate professor of civil engineering at WPI.

Roger R. Osell, Class Secretary

25th Reunion of WPI '58

58 IS GREAT was our motto for the weekend—and it was! From the early comers' Thursday night return to the old Boynton Cafe to the last cups of coffee that we wearily shared at the Sunday brunch, we had a wonderful time.

We read eagerly of our classmates' accomplishments in the yearbook Jim Demetry had prepared. And once caught up, we were off and running. We duffers lifted the turf at Worcester Country Club. We all viewed our own Bill Rabinovitch's exhibit of his expressionist paintings at Gordon Library, hiked around the campus, learned at mini-seminars, antiqued, went landmark hunting and couldn't find the Valhalla—but all spent and spent at Spags, danced, ate, sang, and toasted ourselves at every possible opportunity.

However, we were not on our dignity all the time—a bit noisy perhaps at the Alumni Luncheon. But we were forgiven our fun as we rang bells for ourselves when Dave Crimmins announced 1958's impressive gift to the college. We were proud of our ability to be so generous.

Track coach Merle Norcross, Dean Bill Grogan and Professor Bob Wagner joined us at our Saturday evening banquet. The festivities produced a few surprises from MC Howie Painter and his henchmen, particularly from one Mike "we'll follow you anywhere" Gutman. The devilment went on and on; no one was spared. Clearly, the evening was on its way again. Back home we went to Boynton Hill on one of the best bus rides ever, inspired to stay up all night.

We abandoned our hospitality suite at 3:30 Sunday morning. And with our amiable hosts Dave "Max" Denniston and Stan Graveline, we rolled down the hill for our last night in the dorm.

We kissed, hugged and back-slapped our good-byes at Sunday brunch. Our 25th reunion was history. We made it!

Robert J. Boyea, Reunion Chairman

1955

Brian Kelly, vice president of marketing for Bell Telephone Company of Pennsylvania, has just been assigned the additional duties of vice president of operations. In his new post, he will direct more than 18,000 employees. He also has been elected to the board of trustees of Hahnemann University in Philadelphia.

1956

Chris Baehrecke won a two-year selectman's seat in the Paxton, MA, town election in May. A former town assessor, Chris is president of R. L. Whipple Co., Inc., Worcester.

Robert Farrar was recently elected chairman of the board of directors of the Keene (NH) Co-operative Bank. Past president of the local Rotary Club, former church deacon, incorporator of Cheshire Hospital and past member of the Keene Board of Education, Farrar serves as president of Frederick A. Farrar, Inc., and Farrar Engineering.

After 20 years with Foxboro Co., **Joe Paparella** is now vice president of international operations at Jamesbury in Worcester. The youngest of his three children, **David,** is in the Class of 1986 at WPI.

The Rev. **Paul Schoonmaker** was a member of a group slated to visit Russia in May for the purpose of establishing closer ties with Russia's 5 million Baptists.

1957

Neil Armstrong is assistant purchasing agent at the Lane Construction Corp. in Meriden, CT.

1958

Frank DeFalco, professor of civil engineering at WPI, was named to the Worcester City Planning Board. He is president of DeFalco Engineering Associates, Inc., and a registered professional engineer and land surveyor. Besides two degrees from WPI, he holds a doctorate in structural engineering from the University of Connecticut. This year he was captain of the "Friends of WPI" squash team, which won the "C" League Massachusetts Squash Racquets Association State Championship.

Anthony DiGiovanni was recently named vice president of distribution and engineering at Boston Gas. He is responsible for the installation and maintenance of the firm's underground facilities and piping, as well as the administration of the engineering department.

William Wesolowski holds the post of manager of the Thin Film/PCB Section in the Microelectronics Department at Raytheon Company in Sudbury, MA.

1959

Frederick Costello has been named vice president of Union Carbide Eastern, Inc., a sub-

sidiary of Union Carbide Corporation. He will have charge of the firm's chemicals and plastics sales and marketing activities throughout Southeast Asia and will be based in Hong Kong.

While restoring his 1815 farmhouse in Amostown, MA, **F. Bernard Lally**'s interest in early history and Indian lore led him to write an update of local area history, sections of which have been appearing in a West Springfield newspaper. Helping Dad with the farmhouse restoration are sons **John, '84,** and **Michael, '86.** Lally teaches physics at Chicopee High School.

Morgan Whitney is plant manager of the Electronics Division at Ford Aerospace & Communications Corporation in Lansdale, PA.

1960

George Cadwell, Jr., wrote "Understanding HEPA Filtration," which appeared in the January issue of *MD&DI*. He is vice president of Flanders Filters, Washington, NC.

In January **Larry Cohen** retired from engineering and law. Next year he and his wife, Linda, a clinical psychologist, plan to go to Israel.

In December **Robert Mulholland, Jr.,** was promoted to the rank of colonel in the U.S. Army. He is deputy director for procurement and production at CECOM in Ft. Monmouth, NJ.

Ronald Vieraitis, still employed by Lockheed Missiles and Space Co., is now a supervisor of the systems effectiveness group in Austin, TX.

Peter Zilko has been named director of marketing of Eagle Signal Controls' new industrial business unit in Austin, TX. The unit has responsibility for all Eagle Signal industrial control products.

1961

William Calder, manager of the power supply business unit for the Foxboro (MA) Company, edited the North American edition of Robin Garside's *Intrinsically Safe Instrumentation: A Guide,* published by ISA last spring. He serves as vice president of ISA's Standards and Practices Department.

Thomas Maloney, Jr., a vice president of E.F. Hutton & Co., Inc., was recently named manager of the firm's Boston office. Previously he was manager of Hutton's Burlington, MA, office. He was appointed a vice president in 1981.

William Peirce has been appointed head of the newly created department of computer studies at Cape Cod Academy, Osterville, MA. He has an MBA from Northeastern University.

1962

Jesse Erlich has been elected president of the Boston Patent Law Association and is also serving on the board of governors. His article, "Understanding Patents and the Patent System," appeared in the January issue of *Optical Engineering.*

1963

Dick Dann, staff editor of *Machine Design,* won a Certificate of Merit in the 1983 Jesse H. Neal Editorial Achievement Awards Competition, sponsored by American Business Press. His winning nine-industry series of articles probed different industries, from aerospace to recreational equipment.

Charles Elfreich serves as town engineer in Mamaroneck, NY. One of his innovations has been the hiring of engineering students as part-time summer help to log progress of various construction projects.

Bob Gowdy is now chairman of physics at Virginia Commonwealth University.

Dennis Heath was recently promoted to senior application engineer for GE's Distribution Equipment Marketing Operation.

Robert Magnant is technical director of the Army's Communications Electronics Engineering Installation Agency for the continental United States. He was a recent speaker at the Newport (RI) Naval War College.

Edward Platow is department chief of computer education at Western Electric in Hopewell, NJ.

Jack Slovak was co-author of "Tapping the Reverse Osmosis Market," which appeared in the February issue of *Water Conditioning.* He and his brother, Robert, are principals in The Water Factory, a marketer of reverse osmosis purification equipment in Costa Mesa, CA.

Recently **Nishan Teshoian** was promoted to vice president and general manager of Cooper Petroleum Equipment, a division of Cooper Industries in Houston, TX. He had been plant manager of the firm's pump plant division in Quincy, IL. The company manufactures mud pumps, draw-works and swivels.

1964

BORN: to Mr. and Mrs. **Larry Hull** their third daughter, Kateri Elinor, on December 2, 1982.

Dr. **Joe LaCava** has transferred from Bell Labs to the new AT&T subsidiary, American Bell. He says, "My children have led me into the roles of Scout leader and president of Youth Athletic Leagues."

Dr. **Al Potvin** has been elected president of the IEEE Engineering in Medicine and Biology Society, the largest of the professional societies for biomedical engineers. Also, he has received a National Institutes for Handicapped Research (NIHR) Rehabilitation Engineering Center grant to continue his development of instrumented techniques for assessing function in normal and physically handicapped individuals. Al is professor and chairman of biomedical engineering at the University of Texas at Arlington, where his wife, Jan, is director of technical writing.

Eastman Kodak has appointed **David Wait** as "technical associate of product in the Film Technical Services Division." Most recently he was a product senior engineer.

Lt. Col. **W. Charles Zisch** was recently named director of the Air Force Electronic Systems Division program to modernize Spain's air defense system. Lt. Col. Zisch is responsible for joint U.S. and Spanish efforts in upgrading the country's radar and communications sites.

1965

Phil Baker has joined Atari, Inc., of Sunnyvale, CA, as director of product management in the new Ataritel Division. Previously he held engineering and management positions with Polaroid.

How to Heat for Free —Well, Almost!

Cheap energy! If a genie jumped out of its bottle and offered to grant three of your fondest wishes, low-cost domestic energy could well be first on your list. If you've totted up your oil bill lately, you know that it's somewhere just this side of a king's (sheik's?) ransom.

Well, you don't need to use one of your wishes to save on energy bills. According to Cap Chenoweth, '64, almost all the energy you'll ever need to heat or cool your home is right in the ground beneath your house. Says Cap, sole proprietor of Sunworks Construction and Engineering, Stowe, VT, "A closed-loop, ground-source heat pump can harness this energy and transfer it into the home or business to provide domestic heating and hot water needs at one-third the cost of conventional fuels."

The ground naturally stores heat radiated by the sun, as well as warm rain in the spring, summer and fall. Using a heat pump, this stored ground energy can be extracted and then boosted to higher temperatures for use in heating systems.

A heat pump transfers heat from one place to another. The largest selling model uses 4½ kilowatts of electricity to produce up to 16 kilowatts of energy. "Therefore, about two-thirds of the energy used for heat and hot water," Chenoweth explains, "is obtained free."

A closed-loop ground extraction system is used primarily because it eliminates the massive amounts of water needed to be pumped and then discharged by groundwater heat pumps.

Chenoweth, who earned both his BSME and MSME at WPI, has worked as a marine scientist, ocean engineer and physics instructor. Since 1977, he has been a self-employed contractor specializing in the design and construction of solar-assisted homes and in the sale and installation of solar systems, heat pumps and microprocessor energy management controllers.

Don Carlson has accepted the post of senior managing director of NSK-Torrington Co. in Tokyo. The joint venture company manufactures bearings and other precision components. "It's a homecoming, since it will be our third period of residence in Tokyo."

Joe Gracia holds the post of product manager at Cornell Dubilier Electronics in New Bedford, MA. Married and the father of three children, Joe enjoys sailing.

William Hagar continues as production engineering supervisor with the Davidson Rubber Division of Excello Corp. in Farmington, NH. He has been with the National Ski Patrol for 12 seasons.

Ken Hultgren continues in London as manager of engineering for GE's international mechanical drive steam turbines, for the Mechanical Drive Turbine Department in Fitchburg, MA. Business has taken him to China and Russia. He and his family also have traveled throughout Europe.

Currently **Raymond Jacques** is project manager for New England nuclear power plants at Combustion Engineering, Windsor, CT. The family enjoys tennis on their backyard court.

Pat Moran was chairman for the Boxborough (MA) Bicentennial Parade held on June 25th. He has also made several contributions to the Boxborough Bicentennial book.

John Porter is on active duty as a major in the U.S. Army Reserve and is chief of the Smoke Generator Specialist Branch of the Directorate of Training Developments at the Army Technical School, Ft. McClellan, AL.

B. S. Ramprasad is a principal scientific officer in the Central Instruments and Services Laboratory of the Indian Institute of Science in Bangalore, India. His interests are in holographic interferometry and speckle interferometry for nondestructive testing and flow measurement. He also gives laser demonstrations and lectures in schools and colleges. His poetry, which is based on science, has appeared in the *Journal of the Optical Society of America*.

Henry Schneck holds the post of principal civil engineer for the Suffolk County Department of Public Works. He and his family have a waterfront home on the south shore of Long Island.

Dr. **John Wilson** continues as president of Paul J. Ford and Co., Columbus, OH, a structural-design firm. His children are into group swimming, and Wilson, who is on the board of the Greater Columbus Swim Team, also serves as a U.S. swimming official.

John P. Jacobson, Class Secretary

1966

Phil Hopkinson is manager of engineering for specialty transformers at GE in Ft. Wayne, IN. His outside interests include kayaking, rocketry and swimming.

Dr. **Robert Lisauskas** recently received the Worcester Engineering Society Scientific Achievement Award.

Marty Mastroianni is president of Inland Vacuum Ind., Inc., "the largest manufacturer of vacuum pump fluids in the U.S."

Mike Portanova celebrated his 40th birthday with a surprise party in Concord, MA, attended by many old friends, notably: **Al Giannotti, '65,** who flew in from Denver; **Jim Fee, Paul Giusti, Pat Moran** and **Bill Shields.** Also: **Stan Szymanski, '64,** who made the trip from Youngstown, NY, **Duke Gale** and **Walt Lankau.**

1967

Russell Lukes is now manager of computer operations for Management Decision Systems, Inc., Waltham, MA.

1968

Reunion **October 1, 1983**

Frank Alberti was recently promoted to associate professor at the University of Lowell in Massachusetts. Formerly an assistant professor of mechanical engineering, Dr. Alberti received his BS from Tufts, his MSCE from WPI, his MSME from Northeastern and his PhD from the University of New Hampshire.

Richard Bernardo is director of the high school planetarium in Somerset, MA.

Richard Broggi is project manager at Robert J. Baggett, Jr., Inc., in Mobile, AL.

Ed Cannon has been named Northeast-8 Conference Coach of the Year after leading Saint Anselm's soccer squad to a 5–1–1 conference record and a 9–5–1 overall mark. (Saint Anselm shared the conference championship with the University of Hartford.) Cannon, a former All-America booter, has been with the college for eight years.

John Cunic continues as senior staff engineer with Exxon Research and Engineering Company in Florham Park, NJ. Currently he is head of the Air Environmental Applications Group, where he conducts in-depth screening studies to identify the types of air pollution control equipment required by both affiliate and licensee facilities. He has been involved in the development of the Exxon wet gas scrubbing system for the petroleum industry's fluid catalytic cracking process.

Jeff Decker has been named president of Shoemaker Development Corp., Philadelphia, one of the largest construction firms in the Delaware Valley. He is responsible for identifying and implementing real estate investment opportunities.

Richard Dubsky will spend the next academic year in Israel as chairman of the science department at the Walworth Barbour American International School in Kfar Shmaryahu. He is on leave as chairman of the mathematics department at St. Albans School and as mathematics instructor at the University of Maryland.

Thomas Fitzpatrick has been appointed director of vehicle test systems at RCA Automated Systems, Norwood, MA. Last year he completed the Harvard University Program for management development.

C. David Larson has been appointed international maintenance products manager at A.W. Chesterton Company, Stoneham, MA. He will be responsible for the development and support of industrial and marine maintenance products and systems in the 98 countries in which Chesterton products are marketed.

William Poulin has been promoted to requirements engineer at Pratt & Whitney Aircraft Group. He manages and implements marketing strategies for the PW1120 engine.

Terrence Sullivan, president of Boston Bay Capital, Inc., spoke on "Tax Shelters" at a February meeting of the North Shore Chapter of the National Association of Accountants in Wakefield, MA.

1969

John Gavitt writes: "Am on my way to Japan to be Sperry's representative at the U.S. Navy Yard in Yokosuka."

Since December, **Gordon Mears** has been purchasing manager of Metal Bellows Corp., Sharon, MA.

David Pratt is director of systems engineering at Computer Design and Applications, Inc., in Waltham, MA. The company makes computer array processors and medical-imaging systems. Pratt will direct all software and hardware product development.

Albert Shahnarian, a biomedical engineer at UMass Medical Center in Worcester, has received his PhD from WPI.

Robert Simonds writes: "A two-year-old and infant twins are keeping me busy at the moment." Simonds is now vice president at Hayes Pump and Machinery Co., West Concord, MA.

Francis Skwira, who has two daughters, was recently promoted to director of industrial services at EBASCO Services, Inc.

1970

Lawrence Cohen now has the title vice president-technical at Cavedon Chemical Co., Woonsocket, RI. He joined Cavedon in 1978 as director of research. He has also been with Kendall Company and Union Carbide. In 1982 he rejoined Cavedon.

Ed Mason was slated to transfer as director of logistics with Cummins Engine Company to São Paulo, S.P., Brazil in June.

Robert Smialek has been appointed a highly protected risk (HPR) officer by the Kemper Group. He joined Kemper in Boston in 1970, was named a supervising engineer in Chicago in 1973 and became manager of Kemper's central division HPR department in 1981. Early last year he was transferred to Brussels, Belgium, as general manager and executive vice president of Kemper, S.A.

1971

MARRIED: John Anderson and Patricia Ramsey on March 26, 1983, in Painesville, OH. She graduated from Bowling Green State University and is a teacher. Anderson is with Technicare in Solon.

Robert der Stein has been named vice chairman of the New England Power Tools Planning Committee. An employee of the Massachusetts Municipal Wholesale Electric Co. for the past seven years, der Stein is the first employee of a municipal organization to be appointed as an officer of the committee.

Allen Downs, who continues with Integral Data Systems (IDS) in Milford, NH, recently did the programming for a color graphics project in conjunction with the introduction of the firm's new color printer.

Ed Lowe has a new post as vice president of marketing for GE's Environmental Services in Lebanon, PA.

Stephen Sergio has been promoted to the rank of major in the U.S. Army. He is stationed in an infantry division in southern Germany.

Glenn White has started a resident research associateship under the National Research Council at NASA Goddard Space Flight Center.

1972

MARRIED: Gary Rand and Anne Lauria in East Boston, MA. A senior software engineer at Nixdorf Computer, Burlington, she is a graduate of Emmanuel College. He serves as a project engineer at Xylogics, Inc.

BORN: to Janice and **Tim Laskowski** a son, Kenneth Robert, on April 20, 1983. Brother Craig Anthony is now three.

Michael DiBenedetto has been appointed supervisor of power management by EUA Service Corporation, Lincoln, RI. He will be responsible for power contracting and billing, production costing and power systems analysis. A professional engineer, he holds both a BSEE and an MSEE from WPI.

Jim Hargraves has left Universal Oil Products and now works as a senior instrument and controls engineer in the polymer chemical plants at C.P.I. Plants, Inc., in Southport, CT.

Howard Levine has received his PhD from Rutgers.

Jeff Petry is now direct district manager of the Cleveland office of Torrington Co. Besides keeping up with their four children, **Mary Bolino Petry, '74**, enjoys racquetball and bowling.

William Singleton, Jr., recently started a management consulting company, The Company Doctor of Uxbridge, MA.

1973

Reunion **October 1, 1983**

BORN: to Diane and **Joe Luszcz** a third son last October. Joe, who is slated to receive his MSEE from Northeastern University this year, was recently promoted to project manager at Hewlett-Packard in Andover, MA. . . . to Cheryl and **Stephen Martin** a son, Benjamin Corey, on November 4, 1982. Steve is in his first year of residency in ophthalmology at the University of Rochester Strong Memorial Hospital Center. . . . to Mr. and Mrs. **K. Stephen Williams** their first daughter, Katherine, on October 12, 1982. Steve still works as plant manager and faculty member for Sterling Institute in Craftsbury Common, VT.

Last year, **Conrad Baranowski** became manager of Gould, Inc., Modicom Division, Power Conversion Group. The Baranowskis have a year-old daughter, Diana Lyn.

Richard Brontoli writes: "Have finished grad school at the University of Florida with an ME degree. Now I am stationed at the Ft. Knox area engineer office in Kentucky."

Jason Burbank, a registered professional engineer, is with Energy Auditors & Consultants, Inc., Amherst, MA.

After nearly ten years with Teradyne, **Bill Carton** is now manager of system test and field service with a start-up company, Interactive Images, in Woburn, MA. The company is building an intelligent graphics work station with color CRT and touch-sensitive faceplate.

Last year **David Cirka** received his master's degree in electric power engineering from RPI.

Recently **Robert Drake** was named sanitary engineer for the Town of Framingham, MA. Formerly president of Drake Associates of Framingham, civil engineers and land surveyors, he has an MSCE from MIT.

John Kulig manages engineering services for the steam generation business unit of Babcock & Wilcox's industrial power generation division. He joined the company in 1973.

Mark Mooradian runs Coffee Kingdom on Richmond Ave., Worcester's first café serving top-quality coffees and teas. He has an MS in counseling from Harvard.

Charles Pritchard, no longer with Mid-Maine Medical Center, has joined the staff of Central Maine Power as a programmer analyst.

1974

MARRIED: Joseph McGinn to Debra Gebo of Westboro, MA, on October 29, 1982. Joe, who works as a senior environmental engineer at CE Maguire in Waltham, is active with barbershop quartets and conservation projects in Worcester County.

BORN: to Linda and **Paul ("Butch") Boulier** their first child, Natalie Lynn, on December 29, 1982. Paul is a group leader at Borden Chemical, Inc., Leominster, MA. . . . to Suzanne and **Louis Piscitelle** a daughter, Kathryn Alexandria, on November 23, 1982. Piscitelle is working on his PhD in mathematics at Northeastern and consulting during the summer. . . . to Mr. and Mrs. **Ronald Sarver** a daughter, Lauren Rachel, on December 29, 1982. Ron's business, Ronald Sarver Caterers of Randolph, MA, has expanded into vending and cafeteria catering, besides the primary wedding business. Sarver has been active in the National Association of Catering Executives.

Steve Dacri, of Steve Dacri Productions, North Hollywood, CA, performed at Hollywood's Magic Castle in February, on the cruise ship *M.S. Sagafjord* in March, April and May and was slated to appear at the Chateau De Ville, Framingham, MA, with Tony Orlando in August.

Stuart Daniels is senior plastics chemist at Teknor Apex Co., Pawtucket, RI.

In February **Bob Ferrari** was named principal in charge of the water pollution group at Thibault & Assoc., Providence, RI. His responsibilities are primarily in industrial wastewater treatment. Following three leg operations, Bob is back running again and hopes to see some of his former cross-country teammates at the WPI Homecoming road race.

Ed Gordon, now a senior software engineer at Autech Data Systems in Florida, has been selected for inclusion in *Who's Who in the Frontier of Science & Technology*.

James Ingraham is a senior research engineer with Polaroid in New Bedford, MA.

Dr. **Robert Lindberg** was recently named head of the Systems Control and Dynamics Section in the Aerospace Systems Division of the Naval Research Laboratory in Washington, DC. Bob completed his PhD in mechanical engineering at Columbia University in 1982. He and his wife, Nancy, live in northern Virginia with their children, Bethany, 3, and Christian, 1.

Larry Martiniano is now assistant superintendent for engineering at Stone & Webster, Lycoming, NY.

Mark Ostergren has been promoted by Babcock and Wilcox to program administrator for business analysis of the pulp and paper industry in the industrial power generation division, North Canton, OH. He is responsible for marketing of recovery and power boilers.

Grason-Stadler, Inc. (GSI), of Littleton, MA, has promoted **Janice Painter** to director of marketing. In her new post, she is responsible for the firm's overall marketing function, including sales promotion, service, and its New England sales departments.

Robert Parnass is now a member of the technical staff at Bell Laboratories in Naperville, IL. For the past three years he has been a technical advisor to the American Radio Relay League.

Gary Pontbriand has been promoted to manager of product engineering at Quabaug Rubber Company in North Brookfield, MA. Previously, he was assistant plant manager. He serves as president of the Tri-Community Exchange Club and as a board member of the Charlton Credit Union.

Scott Rine is a deputy equal opportunity officer with the Department of Defense (Navy) Activity and lives in Worcester.

Norman Szamocki has been appointed superintendent of the rope mill at the Bethlehem Steel Wire Rope Division, Williamsport, PA. With the firm since 1974, Szamocki was promoted to engineer at the rope mill in 1976 and to assistant to the superintendent in 1979. In 1981, he was named assistant superintendent.

Peter Thacher writes that he flew around the world last year. His itinerary included an elephant trek through northern Thailand and a camping trip in northern India.

Jim Rubino, Class Secretary

1975

MARRIED: Alan Chandler and Laura Bolling Sullivan in St. Simons, GA, on November 13, 1982. Alan has his MBA from the University of Missouri and is assistant structural engineer with Russell, Gibson, & Von Dohlen in Farmington, CT. . . . **Louis Christoforo** and Karen Kirkland recently in Randolph, MA. She graduated from Randolph High School. They both are employed at Tech HighFi, Randolph. . . . **Michael Simanonok** to Michael Melinda Collier on March 19, 1983, in McAllen, TX. She graduated from SMU in Dallas. Both are with Texas Instruments. Simanonok is a systems analyst.

BORN: to Joan and **Richard Aseltine** a son, Richard, recently. . . . to Brena and **Scott Bicknell** a daughter, Amy Lee, on December 28, 1982. Scott is a senior industrial engineer with the GM Assembly Division in Warren, MI. . . . to Mr. and Mrs. **Robert Cloutier** a second

daughter, Amy, recently. Melissa is two. . . . to Peggy and **Stephen Hernon** a son, Patrick Kelly, March 17, 1983. Son Stephen, Jr., is two. Hernon serves as a computer consultant for firms in New York City. . . . to Mr. and Mrs. **Robert Sooy** a daughter, Kristin Taylor, on August 25, 1982. . . . to Mr. and Mrs. **Frank Vanzler** a daughter, Bonnie Alison, on January 18, 1983.

In December **Mark Antonio** completed requirements for a PhD of philosophy in chemistry at Michigan State University. Employed in the molecular and surface spectroscopy group of Standard Oil Co. Research Center in Cleveland, OH, Antonio also holds an MS from Fairleigh Dickinson University.

Thomas Bower now serves as director of operations and safety for the Department of the Army Chemical R&D Center.

Mark Drown joined the engineering staff at McIntire Company, Thomaston, CT, in March.

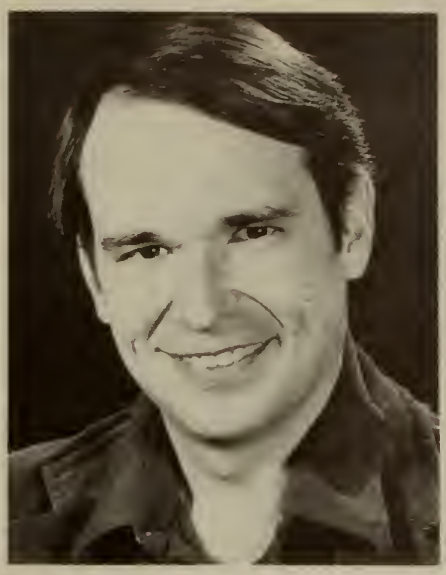
Mark Iampietro serves as corporate manager of documentation and labeling at Delmed, Inc., a medical device and large-volume parenteral manufacturer in Canton, MA. He recently completed the construction of a home in Lakeville, MA.

Paul Loomis is a senior technical service representative for swimming pool chemicals at Olin Corporation. He has a two-year-old son, Douglas Alexander.

David McGowan has been promoted to director of products and technical service at Polyclad Laminates, Inc., Franklin, MA. Previously he was multi-layer product manager, operations manager and manager of multi-layer and specialty products for Polyclad. He has a BS from UMass and an MS from WPI.

Gary Rodgers has been promoted from captain to lieutenant colonel and is now overseas with the U.S. Army 21st Support Command.

John Watkins, a development engineer designing labeling machinery, has applied for his first patent.



The man of many faces

The Play's the Thing For Daniel Robbins

The report of his demise was premature. He was supposed to have been murdered, but there he was, big as life, walking around town looking for the fellow who bragged that he had "done him in." His own son!

In a nutshell, that is precisely the position in which Daniel Robbins, '73 (CE), found himself recently while portraying Old Mahon in Synge's play *The Playboy of the Western World* in Athens, OH. Commenting on the performance, a local critic wrote, "Robbins is rousing as Old Mahon, bringing life to the supposedly dead father as well as the play itself. . . . He is electric!"

Last June, Robbins received his master of fine arts degree through the Professional Actors Training Program at Ohio University, Athens. During his final year of college, he served a four-month internship at the Virginia Museum Theater in Richmond. While there, he appeared in Tiller's *Count Dracula* and Dickens's *A Christmas Carol* and he was an understudy in Kyte's *Tintypes.*

Returning to Athens, he toured colleges and high schools in Ohio and West Virginia as Tom Wingfield in Williams's *The Glass Menagerie.* He ended his residency with the thesis role of Old Mahon in *Playboy*.

Robbins's personal life is not devoid of drama. "A couple of years ago," he explains, "I was working in a show with a 12-year-old boy named Andy. Andy introduced me to his mother, Rita St. Clair, who also happens to have degrees in theatre. Last June 18, Rita and I were married."

Recently Robbins, his wife and stepson moved to Chicago, "where we are launching new careers." They are presently associated with a newly established improvisational group, The Public Access Theatre. The group was scheduled to perform Irwin Shaw's *Bury the Dead* in May.

1976

MARRIED: Douglas Adams and Mary Jo Pupek on April 16, 1983, in Springfield, MA. She attended UMass, Amherst. Both are employed at Massachusetts Mutual Life Insurance Co., where Adams serves as a system analyst.

John Brady is a field sales engineer with Intel Corp. in Houston, TX.

Bob Thorell and his partner, Charlie Schmohl, run Mountain Associates, a local solar panel installation company in Princeton, MA.

Frank Vanecek recently received his PhD in decision science from Kent State University. He is an assistant professor of computer science and head of the economics and business department at Norwich University, Northfield, VT.

1977

MARRIED: Stephen Akers to Janet Fritschen on March 26, 1983, in Vicksburg, MS. She graduated from Michigan State, and they are both employed by Waterways Experiment Station, where Akers is an ocean engineer.

Chris Cocaine has a new post as facilities project engineer at M/A-Com Components in Burlington, MA.

Robert Cundall is now a supply analyst at Mobil Oil Corp., Fairfax, VA.

Gail Nedbor-Gross holds the post of computer marketing manager for Tandy Corp./ Computer Shack in New York City.

Joan Lyshack Roy is a programmer-analyst at Wyman-Gordon Co. in Grafton, MA.

Andrew Sayles of Plympton, MA, has returned home after two years with the Peace Corps in Nepal. He worked on suspension bridge construction in the Himalayan nation, his project being located in the Gorkha District.

Scott Sieburth is a senior research chemist at FMC in Princeton, NJ. He is slated to receive his PhD in chemistry from Harvard this year.

1978

Reunion **October 1, 1983**

MARRIED: Sandra Wyman and George Daniel on February 12, 1983. Sandra and George are starting a business involving energy recovery systems in Bangor, ME. Previously she was with Air Products in Allentown, PA.

BORN: To **Robert** and **Robin Paisner Chapell** their second daughter, Stephanie Lisa, on December 16, 1982. Bob continues as an environmental engineer with LEA. Robin received her MS in environmental sciences at Harvard. . . . to Kathie and **Jim Fowler** a son, Andrew John, on January 14, 1983. . . . to Mr. and Mrs. **David Markey,** a second child, Jennifer Anne, on November 26, 1982. David is a research engineer at Wyman-Gordon.

Steven Diaz is an assistant professor of mathematics at the University of Pennsylvania.

Kevin Ingle was recently promoted to budget manager at Jamesbury Corp., Worcester. "I am becoming quite skilled at repairing and remodelling the house my wife and I just purchased," he writes.

Last year **Ken Kummins** became a principal in Quantum Group, Inc., Berkeley, CA. He manages the Fire Protection Division. His firm is marketing representative for fireproofing material originally developed for the aerospace program (Polaris, X-15, etc.).

Richard Ruscito is a senior process engineer at Olin Corporation in St. Marks, FL.

Lt. **Robert Sachuk,** USN, is currently assistant resident officer in charge of construction at the Marine base, Camp Pendleton, in California. Recently he received the Navy Medal of Commendation for work completed earlier as a staff civil engineer at the Naval Supply Center in San Diego.

Bill Delphos (center) with Jamaica's Prime Minister Seaga at OPIC conference

Bill Delphos: OPIC's Satellite Entrepreneur

Question: How can busy U.S. business executives intelligently explore foreign investment opportunities without having to travel to time-consuming, expensive international conferences?

Answer: Through "Telemission."

Two years ago, the program and term did not exist. Today, "Telemission," the brainchild of Bill Delphos, '74MG, is making U.S. investors happy and creating thousands of jobs in developing nations.

Last year Delphos, vice president of operations for the Overseas Private Investment Corporation (OPIC), introduced telemission, a live-by-satellite meeting linking business groups in six U.S. cities with government ministers and private entrepreneurs in Cairo, Egypt.

The teleconference gave potential U.S. investors the opportunity to talk directly with prospective joint venture partners and government leaders about investment possibilities in Egypt. Walter Cronkite served as U.S. moderator in New York. Presidents Reagan and Mubarak led off the program.

Delphos says, "This was the first time a federal agency had used network satellite technology to make a foreign investment 'visit.' " He was also co-chairman of the follow-up live mission to Egypt two months later.

As a result of the April teleconference, and the June mission, American companies such as Land O'Lakes and Chemtex plan to invest more than $15 million in Egypt, creating 1,200 new jobs.

In October Delphos chaired another successful telemission emphasizing opportunities in the Caribbean islands. The "Telemission" concept has become so popular that other developing nations, including Israel and Indonesia, have sought OPIC sponsorship.

Bill Delphos, who joined OPIC in 1981, previously held management posts with Gould, Inc., of Chicago, where he had been director of Gould's international division. In his current position, in Washington, DC, he is responsible for OPIC's insurance, finance and marketing departments.

James ("Demetri") Shuris has been promoted to construction project engineer at Riley Stoker in Worcester. He joined the firm as a structural engineer in 1980. He holds an MS in construction project management from WPI, where he is currently working for his MBA.

1979

MARRIED: Stephen Blanchette and Doreen Shattuck on August 21, 1982, in Shrewsbury, MA. She is an accountant at Digital Equipment Corp., Maynard, MA. He has received an MBA from Clark University and is an associate program manager at Digital in Stow, MA. . . . **Dean Bogues** and Patrice Bennett of Roslindale, MA, on August 28, 1982. She is a medical technologist at Ortho Diagnostic Systems in Westwood, and he is a sales engineer for Hewlett-Packard in Lexington, MA.

MARRIED: Edward Cuerdon to Nancy Hayden in Waltham, MA, on December 9, 1982. She graduated from UMass, Amherst, holds an MS from Duke University, and is a staff physical therapist for Massachusetts Rehabilitation Hospital. Cuerdon is with United Illuminating in New Haven, CT. . . . **John Jacobson** and Lisa Munroe on November 21, 1982, in Salem, MA. She graduated from Marian Court Jr. College of Business. Both she and Jacobson are associated with GE in Lynn. . . . **Barbara Murtagh** and Stephen McKinnon in Hampshire Hills, Milford, NH, on January 8, 1983. Both with Sanders Associates, she is an electrical engineer and he a financial management trainee. She has an MBA from New Hampshire College and is studying for her MSEE at Northeastern. McKinnon graduated from Northeastern.

Stephen Hull has received his PhD in physiology from Michigan State University.

Paul Keenan has accepted a new post as construction management career development trainee in the Quincy (MA) Shipbuilding Division of General Dynamics.

Paul Peterson was recently promoted to chief underwriter at State Mutual in Worcester. He joined the firm in 1981.

Mark Steblin has been promoted to captain in the Air Force. He is a development electronic engineer at Eglin Air Force Base.

Edward Tidman III has been advanced to assistant loan officer at Mechanics Bank in Worcester. With the bank since 1981, his latest responsibilities include account maintenance and new business development. He is also attending Suffolk University Law School.

1980

MARRIED: John Barghout and Cheryl Pybas in Fiskdale, MA, on June 19, 1982. A registered nurse, she attended Holy Cross College and graduated from Our Lady of the Elms College in Chicopee. Barghout serves as a fire protection engineer. . . . **John Nenninger** and Kathleen O'Leary in Auburn, MA, on October 9, 1982. A registered nurse at the Fallon Clinic, Worcester, she graduated from Worcester State College, Burbank Hospital School of Nursing, Fitchburg, and Fitchburg State College. He is with Cincinnati Milacron, Heald Machine Division, Worcester. . . . **David Wilson** and **Cathy Girouard, '81**, last October. Cathy is a quality control engineer with Digital in Maynard, MA. David works for GTE Sylvania in Needham.

BORN: to Francie and **Brownell Bailey** a son, Brandon Little, on December 10, 1982. The baby's grandfather is **Bruce Bailey, '51**. . . . to Barbara and **Francis Walsh** a daughter, Kaleena Heather, on January 16, 1983.

Mihran Aroian now works for Bethesda Research Laboratories, the largest biotechnology and genetic engineering company in the country. He holds the post of technical service communication specialist.

For two years **Grace Crooker** was a civil engineer doing water surveys for the Peace Corps in Suva, Fiji. She has also been associated with the EPA in Acton, MA, and Denver, CO. She plans to earn a master's degree in sanitary engineering.

Paul Doherty is a chemical engineer with Simtran in Medway, MA. He has an MS from the University of Michigan.

Currently, **Jim Racca** works for the Cleveland plant of Phillip A. Hunt Chemical Co., which has headquarters in New Jersey.

James Sweeney III, a systems analyst, has been awarded GE's Construction and Engineering Services Group's 1983 Young Engineer Award. Sweeney, who works for GE's Energy Applications Program Department in Schenectady, NY, was cited for his economic analysis of eight cogeneration plants on the West Coast.

Eric Worthington serves as a programmer for Ensco, Inc., Springfield, VA.

1981

Deborah Johnson Doherty is a member of the technical staff at TASC in Reading, MA. She holds an MS in statistics from the University of Michigan.

Alan Figgatt serves as a programmer at Scope, Inc., Reston, VA.

William Fletcher is a sales representative for Hewlett-Packard in Lexington, MA.

John Grout continues as a programmer for IBM in Poughkeepsie, NY.

Phil Gallagher works for Electric Boat and lives in New London, CT.

Mary Jane Hall is a design engineer with Nasland Engineering in San Diego, CA.

David Ireland has completed his master's in applied mechanics at Stanford University.

2nd Lt. **David Jensen** has been awarded his silver wings after graduating from USAF Pilot Training School in Lubbock, TX.

Lisa Kosciuczyk, a civil engineering assistant for Los Angeles County Flood Control, has been named an Outstanding Young Woman of America for 1982.

Jack Ryan has accepted the post of product support engineer at Compugraphic Corporation, Wilmington, MA. Previously he was assistant plant engineer for Jannell Truck Bodies in Woonsocket, RI. He also studies part-time for his MS in engineering management at Northeastern University.

1982

MARRIED: Paul Dagle and Ann Marie Irr in Weymouth, MA, on November 20, 1982. She graduated from Becker. Dagle works for the General Dynamics Electric Boat Division in Groton, CT.

John Consiglio, a development engineer with AVCO-Lycoming in Stratford, CT, is active with WPI's jazz and concert music programs.

Ernie Cormier is a design engineer in the space division at Rockwell International, Downey, CA. He also does free-lance engineering in design and microprocessors.

John Hollett is studying for his master's degree at RPI.

Stuart Joseph serves as an electrical engineer with Yankee Atomic Electric Co., Framingham, MA.

Michael Lawrence is now with R. J. Marshall, Inc., Building Contractors, in Seekonk, MA.

Edward Mellon is mechanical design engineer at Texas Instruments in Dallas.

Thomas Potter, an ensign in the U.S. Navy, is enrolled in the Naval Nuclear Power Training Program.

Robert Riotto holds the position of manufacturing engineer at Harris Corporation in Dover, NH.

Gordon Swanson, who was previously with ConDiesel Mobile Equipment in Greenwich, CT, is now a manufacturing engineer with Texas Instruments in Attleboro, MA.

Garrett Thompson is a software engineer for Harris Corporation's government communications division in Melbourne, FL.

Chris Wraight, an account executive with American Bell, Inc., lives in Boston.

School of Industrial Management

Nicholas Moffa, '56, president of Bay State Abrasives, has received an award from the U.S. Treasury Department for his volunteer service in the Savings Bond Program. He sold $21 million worth of savings bonds while chairman of the Greater Worcester Take Stock in America Center for 1981 and 1982. . . . **Scott Sargent, '65,** has been elected a director of Morgan Construction Co., Worcester. Also a vice president and controller, he has been with the firm for 26 years. He graduated from Bowdoin. . . . **Kenneth Perry, '69,** has organized Business Opportunity Counselors, Inc., Auburn, MA, which he serves as president. Previously he was with American Optical Corp. for 25 years, holding administrative, financial, personnel and management positions. He graduated from Bentley College.

Jack Shields, '69, was featured in an article, "A New Strategy for No. 2 in Computers," which appeared in *Business Week* in May.

. . . **Carl Swanson, '70,** has been named director of quality assurance for Fenwal, Inc., a division of Kidde, Inc., in Ashland, MA. He joined the company in 1968 and has served as manager of production engineering and protection systems engineering. A graduate of MIT, he belongs to IEEE and the American Society of Quality Control. . . . **Kenneth Rizner, '80,** was recently promoted to assistant plant manager at Hyde Manufacturing Co., Southbridge, MA. He started with the firm as a student and later became a routing analyst, product manager and special products manager.

COMPLETED CAREERS

Rollin T. Read, '11, died in a nursing home in Windham, ME, on March 4, 1983. He was born in Springfield, MA, on Aug. 13, 1888, and received his BSME from WPI.

During both world wars he was director of safety and plant protection for Du Pont in Wilmington, DE, and Elwood Ordnance plant in Joliet, IL, respectively. After World War I, he was an industrial engineer in the cotton manufacturing plants in New England. Before World War II, he managed the Dan River finishing plant and the Riverside Cotton mills in Virginia. After World War II, he served as a consultant for various firms.

Mr. Read, a past officer of many civic organizations, was a life member of the Windham Historical Society. He belonged to Phi Gamma Delta.

Stanley F. Hunt, '13, died at his home in Abington, MA, in January. He was 91.

A Worcester native, he was born on March 29, 1891. He was a salesman for the steel industry for many years. Among his employers were the former American Steel and Wire Co., Black Steel & Wire Co. and Wickwire Spencer Steel Co.

Mr. Hunt belonged to Phi Gamma Delta, the Masons and the United Church of Christ. During World War I he was an ensign in the U.S. Navy.

William W. Spratt, '14, a longtime employee of Westinghouse, died in Philadelphia on December 19, 1982, at the age of 89.

He was born on Feb. 20, 1893, in Southbridge, MA. He received his BSEE and professional EE degrees from WPI. In 1930 he received his LLB from Duquesne University. For many years he was with Westinghouse in Pittsburgh, where he was an engineer and contract patent attorney. In 1958 he retired from Westinghouse and began a private law practice in Wilkinsburg, PA.

A member of Tau Beta Pi and Sigma Xi, Mr. Spratt also belonged to the American Bar Association, the Kiwanis Club, the Presbyterian Church, the American Legion and the Masons. He was active in Scouting. In World War I he served with the U.S. Navy.

Dr. **Arthur Nutt, '16,** a member of the Aviation Pioneers Hall of Fame and a WPI Emeritus Trustee, died in Boca Raton, FL, on April 22, 1983, at the age of 88.

He was born in New Rochelle, NY, and received his BSME from WPI. A pioneer aircraft engineer, Dr. Nutt was a retired vice president of the Lycoming Division of AVCO and a former vice president of Curtiss-Wright Corp.

The Society of Automotive Engineers (SAE) called Dr. Nutt "one of the world's outstanding authorities on aircraft engines." He developed the first aircraft engine capable of producing 350 horsepower over a 50-hour endurance test. His redesign of that engine powered airplanes that held all the world speed records for a decade. He oversaw development of the famous Whirlwind and Cyclone engines. At Packard Motor Car Co. he helped develop two large jet engines, as well as new models of the Rolls Royce Merlin aircraft engines. At Lycoming he helped produce Wright Cyclone engines that powered 90 percent of the world's commercial airplanes.

Dr. Nutt, who received an honorary doctor of engineering degree from WPI in 1941, was a past president of the SAE and a fellow of the Institute of Aerospace Sciences. He belonged to Tau Beta Pi, Sigma Xi and Pi Tau Sigma, and the Masons and the Sons of the American Revolution. He was a former president of the Western New York chapter of the WPI Alumni Association.

Austin H. Welch, '19, died in Boston, MA, on February 25, 1983. He was 87. He was born in Lowell and graduated with a BSME.

After working for several years as a construction engineer, Mr. Welch taught thermodynamics at Dartmouth's Thayer School of Engineering and at the University of New Hampshire. In 1955 he founded the College of Advanced Science of Canaan, later known as Canaan College.

A 32nd-degree Mason, he also was a charter member of the New Hampshire Professional Engineers and a veteran of the U.S. Naval Reserve in World War I. He belonged to Phi Sigma Kappa and Skull.

John Q. Holmes, '20, a retired General Motors (GM) executive, died in Royal Oak, MI, on February 13, 1983. He was born in Springfield, VT, on Nov. 27, 1898.

Graduated as a mechanical engineer, he worked for Marmom Motor Car Co., Delco Remy (GM), Axelson Machinery Co., Eastern Aircraft (GM) and Buick-Oldsmobile-Pontiac (GM). In 1954 he became a member of the GM process development staff and in 1956 he was named to the GM manufacturing development staff. He retired in 1962 as an executive on GM's engineering staff after 38 years.

Mr. Holmes belonged to Lambda Chi Alpha, the Society of Automotive Engineers, the American Standards Association, the Engineering Society of Detroit and the Circumnavigators' Club, as well as the Masons and the Shrine. He served with the U.S. Army in World War I.

Richard F. W. Johnson, Sr., '20, died on February 16, 1983, in Memorial Hospital, Worcester. A native of Buckland, MA, he was born on February 7, 1898.

Before retiring in 1970, Mr. Johnson was with Riley Stoker, Worcester, for 45 years. Previously he had worked for Pullman Co. and American Locomotive Co. He was a registered professional engineer in Massachusetts.

A charter member of Trinity Lutheran Church, he also belonged to Theta Chi. He was the father of **Richard F. W. Johnson, Jr., '50.**

Roger R. Jenness, '21, of New Smyrna Beach, FL, passed away on February 17, 1983. He was born on Oct. 5, 1898, in Worcester.

After receiving his BSEE, he joined A.W. Shaw Co., Chicago, where he was assistant editor of *Factory Magazine*. He later was concerned with real estate and mortgages. After serving with the Army Air Force Training Command in World War II, he became a professor of electrical engineering at Northwestern University, from which he retired as Professor Emeritus in 1968.

Mr. Jenness belonged to ATO, Tau Beta Pi and Sigma Xi, as well as IEEE, ASEE and the Simulation Council. He had served as president and director of the National Electronics Conference. He held an MS degree from Northwestern.

Joseph Kushner, '21, of Hallandale, FL, died recently. A Springfield, MA, native, he was born on Dec. 25, 1898.

After studying at WPI, he joined the family's wholesale grocery business. In 1936 he became president of his own grocery business, Consolidated Brokers, Inc., in Springfield.

A member of the Tech Old-Timers, Mr. Kushner had also been active with the Boy Scouts, food broker organizations, his church, the Shrine and the community educational board.

William ("Jerry") Martin, '21, died in Winchester, MA, on March 28, 1983, at the age of 84. He was born in Chelsea, MA.

He graduated with his BSME. Prior to his retirement, he was a sales manager for Potter and Johnson, a machine tool manufacturer in Pawtucket, RI.

Mr. Martin had served as chairman of the local chapter of the American Red Cross. He was president of the Class of 1921's 45th reunion committee, a former class vice president and past president of the Boston chapter of the Alumni Association. He belonged to Sigma Phi Epsilon.

Howard F. Stephenson, '27, passed away at his home in Plainville, CT, on January 7, 1983. He was 76.

A Plainville native, he was born on Jan. 23, 1906. He graduated as a mechanical engineer. From 1927 to 1934 he was with Veeder Industries, Hartford. In 1968, following 33 years of service, he retired from New Departure/Hyatt Bearings, a General Motors division in Bristol.

Mr. Stephenson, who was active in Scouting and Congregational Church work, belonged to Phi Sigma Kappa, the Tech Old-Timers and the Hartford Engineers Club.

Lincoln H. Peterson, '28, died at home in Sarasota, FL, on February 17, 1983, at the age of 76. He was a Worcester native.

After graduating as an electrical engineer, he joined the New York Telephone Co. Later he was associated with Bell Telephone Labs and AT&T, from which he was retired.

Mr. Peterson was a member of SPE, the Albany Society of Engineers, the Elks, the Masons, the Presbyterian choir and the Memorial Society of Sarasota. He was the father of **Paul Peterson, '66.**

Boris Dephoure, '29, of Hollywood, FL, a former merchandise group manager for Sears Roebuck, died of a heart attack on January 14, 1983.

He was born on August 30, 1907, in Worcester. A graduate ME, he had served as a Flying Cadet with the Army Air Corps and had been employed by Stone & Webster Engineering. In World War II he was with Army Ordnance in Boston. From 1947 to 1967, he worked for Sears Roebuck.

William B. Kenyon, '31, of Springfield, MA, died recently. He was born in Indian Orchard on April 15, 1906.

After receiving his BSME, he joined Fiberloid Corp., now Monsanto. Later he worked for Consolidated Engineers and American Bosch Arma Corp. in Springfield.

A registered professional engineer in Massachusetts, Mr. Kenyon also belonged to the Chicopee Mfg. Association and the local taxpayers' association.

Harold F. Lorenz, '31, passed away in Old Saybrook, CT, on February 22, 1983, following a long illness. He was born in Meriden, CT, on Dec. 30, 1907.

He graduated with a BSEE and MSEE from WPI. During his career, he was a general manager for L.C. Doane Co., Essex, CT, and an electrical engineer for Electric Boat Division of General Dynamics, from which he retired in 1969.

James McWhirter, Jr., '31, of Moylan, PA, died on December 24, 1982. He was a retired general manager of Pennsalt Chemicals, Philadelphia.

Born in Scotland in 1909, he was a member of the Class of 1931 at WPI. He received his BS and MS at Middlebury College.

Since joining Pennsalt in 1945, he had held several production management positions, including manager of manufacturing for the Philadelphia division.

Percival G. Ridley, '31, a retired manufacturer's agent, died in Hot Springs, AR, on January 11, 1983. He was 73.

A Worcester native, he graduated as an electrical engineer. He worked for American Steel & Wire and Gavitt Mfg. Co. In 1946 he established Ridley Associates in Chicago.

Mr. Ridley was active with the Masons, Lions International (10-year monarch) and Elks, and he held a number of civic posts. He had served as president of the Electronics Representatives Association, Chicagoland chapter.

Alumni Regional Contacts

Boston: James R. Hall '76; 58 Margin Street, Cohasset, MA 02025; 617/383-6081.

Buffalo: James M. Kelly, Jr. '63; 239 Sycamore Street, East Aurora, NY 14052; 716/652-6073.

Chicago: Charles F. Hunnicutt '65; 35 W. 785 Park Lane, Saint Charles, IL 60174; 312/584-0631.

Cincinnati: David C. Johnson '66; 600 Doverdale Drive, Monroe, OH 45050; 513/539-9323.

Cleveland/Akron: Martin J. Burgwinkle, Jr. '75; 5814 Allanwood Road, Parma, OH 44129; 216/845-6695.

Denver: Merico E. Argentati '70; 6389 S. Jasmine Way, Englewood, CO 80111; 303/771-8453.

Detroit: Edward W. Eidt, Jr. '57; 26400 Meadowview, Farmington Hills, MI 48018; 313/477-3554.

Hartford: Charles D. Konopka '68; 748 Boston Neck Road, Suffield, CT 06078; 203/668-7222.

Houston: Paula E. Stratouly '76; 1907 Courtney Lane Dr., Houston, TX 77042; 713/782-9575.

New Haven: David W. Hoskinson '57; 45 Still Hill Road, Hamden, CT 06518; 203/281-3754.

New York City: Ronald A. Howard '77; 220 E. 54th St., New York, NY 10018; 212/758-8663.

No. California: Leo F. Cournoyer '59; 7018 Waldheim Court, San Jose, CA 95120; 408/268-6495.

No. New Jersey: John E. Anderson '71; 3 Birch Terrace, Somerset, NJ 08873; 201/469-5757.

Phoenix: Howard O. Painter, Jr. '58; 10 West Country Gables, Phoenix, AZ 85023; 602/863-0178.

Pittsburgh: Robert G. Newton '40; 6 Norway Rd., Forest Hill, Pittsburgh, PA 15221; 412/244-1498.

Pittsfield: Robert J. Bugley '58; Interlaken Crossroad, West Stockbridge, MA 01266; 413/298-4413.

Poughkeepsie: Denise C. Gorski '75; 23 Sunnybrook Circle, Highland, NY 12528; 914/691-8928.

Raleigh/Durham: Mark S. Richards '73; 11 Polks Landing, Chapel Hill, NC 27514; 919/933-1469.

Rochester/Genesee: Harry A. Hoyen, Jr. '63; 593 St. Rita's Court, Webster, NY 14580; 716/671-2625.

St. Louis: William C. Rogler, Jr. '57; 12937 Lampadaire Dr., St. Louis, MO 63141; 314/878-5483.

Springfield: David O. Scott '74; 15 Mallowhill Road, Springfield, MA 01129; 413/736-5999.

Syracuse: Steven J. Silva '76; 5344 Amalfi Dr., Clay, NY 13041; 315/699-9292.

S. New Hampshire: Stanley W. Graveline '58; 35 Monica St., Nashua, NH 03060; 603/888-1474.

Tri-City: Michael J. Herberg '80; 301 3rd St., Apt. 3, Troy, NY 12180; 518/272-1220.

Washington, D.C.: Davis S. Watson '46; 13223 Hathaway Dr., Silver Spring, MD 20906; 301/949-6135.

Wilmington: Harold F. DeCarli '52; 2405 Landon Drive, Wilmington, DE 19810; 302/478-3530.

Worcester: Timothy J. Mackie '70; 15 Sharon Drive, Princeton, MA 01541; 617/464-2692.

Roger W. Bruce, '36, a retired vice president of Persons-Majestic Mfg. Co., Worcester, died in March. A native of Toronto, Canada, he was born on Sept. 27, 1914.

He graduated as an electrical engineer. For many years he was with American Steel & Wire (now U.S. Steel, Cable Division), Worcester, from which he retired as general superintendent in 1972. During World War II he served as a captain in the Air Force Signal Corps. He belonged to SAE.

Mr. Bruce was a past president of the Worcester County Republican Club and the Worcester Area Mental Health Association. (The Association's health center is called the R. W. Bruce Health Center.) He was a former member of the Worcester Planning Board and Central Massachusetts Regional Planning Commission.

Herbert W. Shaw, Jr., '40, a former insurance executive, died January 21, 1983, in Morristown, NJ, at the age of 64. He was born in Milford, MA.

Mr. Shaw, an electrical engineer, retired as executive vice president of the American Re-Insurance Company in New York City in 1981. Prior to joining the company in 1963, he had been with Springfield Fire & Marine, Hutchinson Rivinus & Co. and the Factory Insurance Association.

In World War II he served as a lieutenant in the South Pacific with the U.S. Navy. He belonged to Phi Gamma Delta and the Methodist Church.

William C. Richardson, '41, of Troy, VA, a class agent, died on February 5, 1983. He was born in Worcester on March 25, 1919.

A mechanical engineer, he was with Newport News Shipbuilding and Dry Dock Co., the U.S. Navy Dept. of Public Works, and for four years he was with the U.S. Air Force, being discharged as captain. For thirty years he was an employee of American Telephone & Telegraph's Long Lines Dept. He retired as an estimate engineer.

Mr. Richardson belonged to Lambda Chi Alpha, and he was active in Scouting and church work. He was past president of the Philadelphia chapter of the WPI Alumni Association.

Charles C. Shattuck, '45, an engineer for Nuclear Metals, Inc., died in Concord, MA, on January 30, 1983, at the age of 59. He was a native of Wellesley.

Following graduation as a mechanical engineer, he was employed by GE, A. C. Nielsen Co., Time-O-Matic, Inc., Titeflex Co. and Nuclear Metals.

He was a member of Sigma Alpha Epsilon and the American Society for Quality Control, and he was active in Scouting. Other memberships were with the Sons of the American Revolution and the National Association of Clocks and Watches.

Donald H. Gilmore, '46, former controller for Rodney Hunt Co., Orange, MA, died in Worcester on March 24, 1983. He was born in Orange on Oct. 30, 1925.

A mechanical engineer, from 1947 to 1952 he was with WPI's Alden Hydraulic Laboratory, after which he joined Parker & Harper Mfg. Co., Worcester. During World War II he was a lieutenant in the U.S. Navy. He was in the USNR for 20 years.

Mr. Gilmore, a registered professional engineer, belonged to SPE, and was a past master of his local Masonic lodge. He was also associated with the Knights Templar, the Eastern Star and the Rainbow Girls.

Charles H. Rollins, '48, died in Worcester on December 24, 1982. A Worcester native, he was born on December 6, 1927. He belonged to Lambda Chi Alpha.

After studying chemistry at WPI, he entered the University of Massachusetts and received his BA in 1950. He had served as foreman for the Norton Company Refractories Division inspection department in Worcester.

Prof. **Leon S. Bedard, '64,** of Westminster, MA, passed away on February 18, 1983. He was 50.

He was born in Fitchburg, later receiving his BS from Lowell and his MSEE from WPI. He taught at Worcester Junior College and Lowell Technical Institute. At the time of his death, he was a professor in the Science and Technology Division of Mount Wachusett Community College in Gardner.

Prof. Bedard was a registered, professional engineer and a past president of the Cable Club of Fitchburg, as well as a member of St. Edward the Confessor Church. He served with the Air Force during the Korean conflict.

Dr. **Joel B. Kameron, '67,** of Fairlawn, NJ, died recently.

A native of New Bedford, MA, he was born on January 6, 1946, and graduated with his BSEE from WPI. He received his MA in psychology from the University of Michigan and his PhD in environmental psychology from City University of New York.

Dr. Kameron had taught at Paterson State College, Wayne, NJ, prior to his current post as assistant professor at Ramapo State College in Mahwah. He belonged to AEP and PME.

Some things change.
Some don't.
You, for instance. And WPI, too.

See you at Homecoming on the Hill.
And Reunion Weekend for the classes
of '68, '73 and '78. Plan now to attend!

WPI Journal

Tech Old-Timers: 25 Years Young
The Future of Computer Graphics

A MESSAGE

From Harry W. Tenney, Jr., '56,
Alumni Association President

Autumn is upon us once again. And with it Boynton Hill has shifted into high gear from summer's more leisurely pace to the excitement and anticipation of the new school year. Our Alumni Association, which I am privileged to lead this year, is back into the swing of things, too. We are now putting into action the programs which we hope will continue the outstanding growth and progress made by the Association in the past few years.

Much of this growth is due to the creative, prudent and untiring leadership of Peter Horstmann, '55, whose term as president concluded in June. The Association and the WPI community owe a large debt of gratitude to Peter and his program chairmen for the tremendous gains made during their tenure. For example,

- The Alumni Admissions Program is now active in 29 regions, with more than 400 volunteers. In this program, alumni contact high school students interested in WPI and represent the Institute at college fairs across the country.
- Regional Club programs have increased dramatically; there is now activity in 35 areas of the country.
- Through the efforts of the Student Alumni Society, the Alden Carillon was refurbished just before Christmas 1982. These students also saw to it that the Tech Bible was printed for the first time since 1968. They held a reception in the fall of 1982 for the incoming freshman sons and daughters of alumni, and they now present a class banner to each incoming freshman class.
- Reunion and Homecoming planning over the past three years has resulted in record attendance each year.
- Staffing needs of the Alumni Office were studied, and recommendations endorsed by the Alumni Council have been made to President Cranch.

Yet the single most significant accomplishment of the last few years is what alumni have done for the college through their gifts to the Alumni Fund. Your continuing support has boosted the Fund to

$841,000 in 1983 and has brought the annual participation level to just over 40 percent. This extraordinary support by WPI alumni has brought national recognition to the college throughout the past decade from the Council for the Advancement and Support of Education (CASE). Only two other colleges have received the same high accolades.

Such outstanding performance in so many areas creates a double-edged sword for the future. It's a tough act to follow, but high performance provides the basis and momentum needed to move the alumni program to new heights. Every alumni program aims to increase alumni awareness and to enhance the image of WPI and alumni pride in their alma mater. Further, we hope to increase alumni support of the college, both through participation in these programs and through continued growth in the Alumni Fund, which is expected to top $1 million this year.

Numerous other programs, both on and off campus, are designed to keep alumni in contact with their alma mater and indeed to help shape the college's future. These include:

- The Corporate Contacts Program, in which WPI alumni employed by any of 18 companies have an active program for involvement and a readily available channel for communication.
- The Citations Committee continues to recognize and honor deserving alumni and is developing yet other ways of citing the accomplishments of our alumni.
- At Homecoming in October, the WPI Athletic Hall of Fame was launched with the induction of eight charter members, six of them alumni. This was the result of many years of effort by alumni involved with the Poly Club.
- Our Publications Committee provides counsel to the editor of the WPI *Journal* to assure our alumni a consistently high-quality publication, bringing alumni knowledge of, and pride in, their alma mater and their fellow alumni.
- The Public Relations Committee has set its sights on developing ways to increase the attention WPI receives from the media across the country, thus enhancing and broadening WPI's image and reputation everywhere.
- Alumni are becoming more active on campus by participating in both technical and non-technical seminars, by working with the Student Alumni Society and by providing assistance in many of the academic projects students undertake.

I hope from this brief overview that you can sense the magnitude of the activity taking place in the Alumni Association and with the alumni programs. More importantly, I hope you share my pride in WPI and my enthusiasm for the 1983–84 year and the years beyond. If you are not already involved, I invite you to take a first step and become involved in the programs in your local area. And plan to attend Homecoming or your class reunion.

If I can be of any assistance, by providing, for instance, information about programs in your local area, please feel free to contact me by dropping me a line, c/o the WPI Alumni Office. I'll be pleased to respond. WPI, our Alumni Association and our programs are only as strong as we—each individual alumnus—make them.

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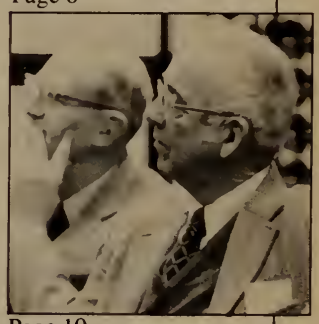
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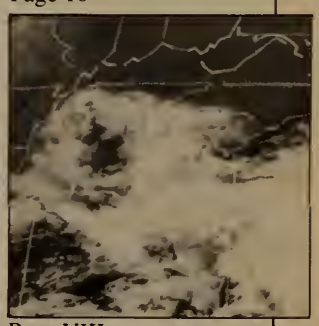
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Cover: Lengthening shadows on the practice field and summer's greens turning to autumn's reds and golds are a frosty reminder of days to come. Photo by Michael Carroll.

NEWS FROM THE HILL

Class of '87 Sets Enrollment Mark

In the face of a shrinking college-age population nationally, WPI's undergraduate enrollment is at an all-time high, according to Roy A. Seaberg, Jr., '56, Director of Admissions. In September, while many colleges, especially small liberal arts schools, struggled to attract qualified freshmen, WPI seemed about to burst at the seams as it welcomed 670 members of the class of 1987. This performance, says Seaberg, is a ringing endorsement of WPI's broadening reputation for preparing tomorrow's engineers, scientists and citizens.

Overall, says Registrar Robert Long, 2,605 students registered for classes on August 29, the first time enrollment has topped the 2,600 mark. A declining rate of nonreturning upperclassmen, coupled with the record freshman class, accounts for this unusually large enrollment, he says.

During the past year, 2,335 high school students applied for admission; WPI accepted 1,425. Some 85 accepted, "early decision" candidates decided prior to December 31, 1982, that WPI was their first choice. In all, the yield—the percentage of accepted candidates who decided to matriculate, less early decision candidates—was more than 45 percent.

A cross section of the freshman class shows exceptional academic achievement, resourcefulness and diverse backgrounds and interests. On average, entering freshmen ranked in the top 9 percent of their high school senior classes. Average SAT scores were 650 math and 540 verbal, compared with the national average of 470 math, 435 verbal. Seventy-three percent of the '87 class participated in high school sports, and 31 percent took part in high school publications like newspapers, yearbooks and literary organizations.

A significant shift, says Seaberg, is the welcomed upsurge in applicants from private and parochial schools. Applications among these students were up by 6 percent; the yield jumped by more than 30 percent. In addition, at least 80 percent of freshmen have held summer jobs, and some 70 percent have worked part time during the school year.

Yet while this year's admissions results paint a rosy picture, demographic trends for the coming decade will force even greater competition with other selective schools for a declining number of high-quality candidates.

"We're moving *now* to respond to those trends," says Robert F. Reeves, Vice President for Student Affairs, "so that we can minimize the impact of a rapid and far-reaching downward shift in the number of 18-year-olds across the nation, and especially in New England."

Capital Program Goes Over the Top

"We have every reason to celebrate!" Raymond J. Forkey, '40, WPI Trustee and Chairman of the Capital Program, exclaimed in his closing report. "We have exceeded our goals by over $2 million."

Launched in 1979, the Capital Program had an original goal of $13.2 million. In 1981, Forkey reports, in light of an anticipated need for additional funding for the Washburn and Atwater Kent renovations, the goal was revised to $15.7 million. On June 30 of this year, at the Program's conclusion, WPI had received commitments amounting to more than $17.7 million.

Aside from funding major renovations of Washburn Shops (Mechanical Engineering) and Atwater Kent Laboratories (Electrical Engineering), the Program's primary objectives were to improve Stratton Hall (Mathematical Sciences) and the athletic fields, as well as to increase both the college's endowment and operational support.

"Our strategy," says Forkey, "was to conduct a targeted campaign to a small, well-defined audience, focusing on foundations, corporations, trustees and a small group of major gift prospects." The school also invited alumni to increase their support to the Alumni Fund, he says.

During each year of the Program, alumni set records for both dollars pledged and percentage participation. In the 1978–79 academic year, the Fund raised almost $576,000 from 4,500 donors. "This past year," says Fund Board Chairman Gerald Finkle, '57, "some 5,580 alumni made gifts totaling $841,032." Through their gifts, he says, WPI alumni have ranked in the top 2 percent nationally in triggering matching corporate gifts on a per capita basis.

A breakdown of the campaign's results reveals that capital funds committed to the Program totaled nearly $12 million, against an original goal of $11.4 million. This amount, however, fell short of the revised goal of $12.8 million.

A number of capital objectives underwent substantial change during the Program, Forkey says. The Atwater Kent project, for instance, started as a renovation but was completed as a total rehabilitation, including an addition for Computer Science, calling for funds of $3.5 million against an original goal of $2.02 million.

The Washburn project also changed from renovation of the Shops alone to refurbishing the Laboratories as well, plus construction of a three-story addition.

Besides the Washburn and Atwater Kent programs, capital projects successfully funded by the Program include Kaven Hall (Civil Engineering), the Computer-Aided-Design (CAD) Lab, equipment for Atwater Kent and other facilities, endowment, and unrestricted gifts.

A vital and often overlooked element of WPI's fund-raising effort, says Forkey, is its Planned Giving and Bequest Programs. During the campaign, WPI identified an additional 45 alumni and friends who have informed the school that WPI is in their wills, bringing this total to some 200 declared expectancies.

In addition, the school now has on the books irrevocable trusts representing an additional $5.5 million that will mature to the college.

"Volunteer support," Forkey contends, "was a key ingredient of the Program's success. Whenever we called upon trustees or alumni for assistance in solicitations, introductions or simply advocating our cause, we were not once refused!"

While celebration is indeed in order throughout the WPI community, Forkey hastens to mention that several Program objectives have not yet been fully funded. For example, because of the overwhelming importance of upgrading and expanding academic facilities in Atwater Kent and Washburn, construction of a Central Services building was removed from the objectives, and improvement of playing fields has not yet been funded. In addition, funds are needed for latest-generation equipment for Materials Processing and Manufacturing Labs as well as the soon-to-be-completed Washburn Shops/Labs.

But Forkey is optimistic that by year's end, some $250,000 to $300,000 will be secured for these purposes. What is more, he says, very soon gifts approaching $1 million should be committed for vital improvements to playing fields.

"There was no magic in raising the Capital Program's outstanding level of funds," Forkey concludes. "The strength of our academic programs, the commitment of our faculty, and the loyalty of our alumni and trustees were the central factors contributing to our success. We heartily thank each of you."

The Annual Fund Keeps Breaking Records

Making and breaking news is exciting, and the 1982–83 Alumni Fund did just that. On June 30th, as the Fund year ended, alumni participation reached 40.32 percent, the highest level ever. This figure represents a rate of participation that is 21 percent higher than the national average!

At the same time, a record cash figure of $841,032 in alumni gifts was recorded for the annual giving program.

"Fantastic!" was the response of outgoing Fund Board Chairman Henry Styskal, Jr., '50, when he heard the news. He credited the success to the diligent efforts of his fellow Fund Board members, Richard A. Davis, '53; Gerald Finkle, '57; Richard B. Kennedy, '65; Allen H. Levesque, '59; C. John Lindegren, Jr., '39; Philip H. Puddington, '59; and John M. Tracy, '52, who organized the nearly 1,300 alumni and student volunteers for the Fund. "WPI alumni volunteers just keep on giving of both their time and financial resources. That's remarkable!" added Styskal.

But the icing on the cake was receiving word from CASE (Council for the Advancement and Support of Education) in May that WPI would receive three CASE recognition awards for the Fund: two exceptional achievement awards for improvement in financial support and matching gifts, and a citation for its direct mail program. In conveying its congratulations, CASE noted that the Fund program "reflects one of the strongest annual fund programs in the nation."

Alumni and student volunteers persuasively convinced alumni to contribute $841,032 in individual gifts. Leading the effort were the classes of '33, '43 and '58, which collectively contributed $326,022 through anniversary gift programs over a three-year period. (And 82.5 percent of the members of the Class of '33 joined in that effort.) Gifts from these classes will be restricted to projects in Washburn Labs and Shop.

Other highlights of the Fund year:

•This year was the best ever for contributions made through corporate matching gift programs. A record $255,556 in funds was received from 291 corporations that matched gifts made by WPI alumni who are employed by those corporations.

•A new Fund program, Major Gifts, resulted in $125,272 from 74 alumni. Coupled with the additional $76,869 in gifts at the President's Advisory Council level, these two Fund segments accounted for 24 percent of the campaign's total.

•The five year reunion classes of '28, '38, '48, '53, '63, '68, '73 and '78 contributed $111,121, a remarkable 34.6 percent increase over their collective class gifts to the 1981–82 Fund.

•Two hundred student volunteers recorded 1,446 pledges for $57,727 during eight evenings of phonathons in April—an all-time record. In fact, Phi Sigma Sigma, the college's four year old sorority, raised the largest amount in one evening—$8,694 from 224 alumni.

"The most rewarding part of the entire program," says Fund Managing Director Sharon C. Davis, "is the important work the college can do as a result of annual giving." For example, an additional 100 students will be supported this year through gifts made to the Fund. Many of these students could not have attended WPI without this additional aid. "Making these opportunities possible is exciting, and sharing such good news with you, our alumni, is the fun part! Thanks for making it possible."

Alumnus to Serve as WPI Vice President

Effective September 1, Donald F. Berth, '57 CHE, '59 MS CHE, became Vice President for University Relations at WPI. He succeeds Thomas J. Denney, who assumed the post of Vice Chancellor for Alumni and Development Programs at Washington University, St. Louis.

In his new appointment, Berth will manage all college development and fund raising, alumni relations, public and press relations, and publications.

In joining the WPI staff, Berth leaves a 20-year career at Cornell University. Most recently he held the post of Associate Dean of Engineering, serving as chief development officer of the College of Engineering. Since joining Cornell in 1962, he has held a number of positions, including co-director of the engineering cooperative program and director of engineering projects. He was founding editor of *Engineering: Cornell Quarterly*, a highly respected college magazine reporting on Cornell research and engineering college activities. He also directed the engineering school's centennial celebration in 1971.

From 1971 to 1973, Berth was director of development and public relations at Hampshire College, Amherst.

In following the recommendations of a search committee composed of faculty, staff and alumni, President Cranch said of the Berth appointment, "We are pleased to welcome Don back to the WPI campus. His wide-ranging experience in engineering higher education, development and public relations, and his familiarity with WPI and its alumni are just the combination of qualifications we sought. And while he has resided in Ithaca [NY] for nearly two decades, he still considers himself a New Englander, with roots in Wilbraham, MA."

Berth has served in several alumni capacities at WPI. He has been an Alumni Council representative and National Chairman of the Alumni Secondary School Organization, as well as a member of the nominating committee for Association officers and a member of the Publications Advisory Committee.

Denney, who joined WPI in 1971, managed two highly successful capital programs, the most recent concluding this past June 30 (see story, previous page). In this five-year program, the goal of $15.7 million was surpassed by more than $2 million, with some $17.7 million committed to date.

Ruggers in Paradise, Jamaican Style

Back in 1870, as WPI's Pioneer Class was entering its junior year, universities like Harvard, Yale, Columbia and McGill were experimenting with a sport new to Americans—rugby. In fact, it was from rugby, whose roots lie in Europe, that Yale's Walter Camp fashioned a similar yet wholly new sport, the one which for countless millions of Americans *is* autumn Saturday and Sunday afternoons: football.

To this day a sport relatively unknown to many Americans, rugby arrived on the WPI campus in 1981 as a club sport, attracting, as it does wherever it is played in the U.S., a loyal cadre of players and few spectators. WPI's normal schedule includes club teams from Eastern colleges like Harvard, MIT and RPI. Until last spring, that is, when the WPI ruggers journeyed (at their own expense) to sunny Jamaica to face several of the island's best clubs, including the Jamaican national team.

During what was in Worcester a dreary week late in March, Professor Herbert Beall, CH, rugby club faculty advisor and coach, escorted his WPI ruggers through three matches of international competition. Between games, the team enjoyed the hospitality of Jamaican team members, swam the Caribbean's gorgeous lagoons, and saw the island's sights.

"Our arrival," recalls Beall, "made Jamaican television, as did three of our games. Two we won," he adds, "the other we lost."

Jamaica may seem a long way from Worcester for a rugby game. Actually, the contact was made by Beall back in 1974, when, on sabbatical in New Zealand, he met Professor Tony Greenaway, who now teaches chemistry at Kingston's University of the West Indies. He also plays on the Jamaican national team, the Barbarians.

WPI trounced the Jamaican Army team, 44-0, and won handily over the Chairman's 15, the national "B" team, by a score of 28-3. But the National "A" team, whose regular matches take them throughout the Caribbean, handed WPI a 22-9 loss. ". . . A solid game for us," Beall says, "but they beat us fair and square."

WPI ruggers scrimmage against the Jamaican Army team. left to right: Jim Pouliopoulos, Andy Bruno, Bill Lamberti, Bob Hansen.

It was in the Chairman's 15 game that Beall's wife, Barbara, served as a referee, an event that raised more than a few Jamaican eyebrows. A union referee for New England rugby, her appearance in the Jamaican stadium, a setting Herb fondly refers to as reminiscent of a Kipling novel, was unusual to say the least, for she became the first woman ever to referee a Jamaican rugby match.

Half-time festivities may have raised a few American eyebrows as well, for it was then and there—on the playing field—that Jamaican children grazed their goats!

Later, prior to the men's game with the Barbarians, WPI's women's team played the Jamaican Amazons. But since women's rugby is unknown in Jamaica, WPI's 24-0 win came against Jamaican women who had never before played the game. At home, WPI women face schools such as Mount Holyoke, the University of Connecticut and Holy Cross.

WPI's men's team is led by brothers Carlos, '84, and Rolando, '86, Zuccolillo, whose home is Paraguay. Carlos, the team captain, helped Beall get rugby off the ground at WPI, and Rolando has played on the Paraguayan national team.

One big difference between rugby and football, Beall contends, is the strictly amateur status of all ruggers—worldwide.

Another characteristic of ruggers that seems universal is their love of a rousing party after every game—not just among team members, but among players from both the winning *and* losing teams. Keen competition on the field gives way typically to kegs of beer, singing of songs and a sense of community that transcends team, national, language and race boundaries.

"It's a rough sport, this rugby," Beall concludes, "yet when the game's over, it's the experience, the friends we've made and the healthy competition that we recall, not so much who won and who lost."

WPI 1983–84 Winter Sports Schedule

Varsity Basketball

Date	Opponent	Home/Away	Time
December			
2-3	Worcester Four Home Federal Savings Classic Tournament (Clark, Nichols, Worcester State)	Home	6:00 and 8:00
6	Babson	Away	7:30
8	Wesleyan	Away	8:00
10	Bowdoin	Home	4:00
13	Amherst	Away	8:00
January			
13	Thomas	Home	7:00
16	Lowell	Home	8:00
20	New York University	Home	7:30
21	Bates	Home	8:00
24	Anna Maria	Home	8:00
27	Middlebury	Away	7:30
28	Norwich	Away	4:00
31	Trinity	Away	8:00
February			
3	Coast Guard Academy	Home	8:00
8	Williams	Home	8:00
11	Tufts	Away	8:00
16	M.I.T.	Away	8:00
18	Suffolk	Away	2:00
20	Brandeis	Home	8:00
22	Nichols	Home	8:00
25	Clark	Away	8:00
29	Connecticut College	Home	8:00

Junior Varsity Basketball

Date	Opponent	Home/Away	Time
December			
6	Babson	Away	5:30
8	Wesleyan	Away	6:00
13	Amherst	Away	6:00
January			
31	Trinity	Away	6:00
February			
4	Worcester Academy	Away	4:00
8	Williams	Home	6:00
11	Tufts	Away	6:00
20	Brandeis	Home	6:00
22	Assumption	Home	6:00
25	Clark	Away	6:00
29	W.I.T.I.	Home	6:00

Women's Basketball

Date	Opponent	Home/Away	Time
December			
1	Barrington	Home	7:00
8	Emmanuel	Away	7:00
10	Bowdoin	Home	2:00
12	Western New England	Away	6:00
14	Rhode Island College	Home	7:00
15	Framingham State	Home	7:00
28	Kean College Christmas Tournament (Kean, SUNY-Stony Brook, Upsala)	Away	6:00 and 8:00
29	Union (New Jersey)	Away	6:00 and 8:00
January			
17	Anna Maria	Home	7:00
19	Gordon	Away	6:00
21	Merrimack	Away	2:00
23	Coast Guard Academy	Away	7:00
24	Nichols	Home	6:00
27	Trinity	Home	7:00
30	Suffolk	Home	7:00
31	Wheaton	Home	7:00
February			
3	Colby	Home	6:00
8	Brandeis	Away	7:00
10	Bates	Home	7:00
11	Babson	Home	4:00
14	Amherst	Away	7:00
16	M.I.T.	Away	6:00
19	Fitchburg State	Away	6:00
21	Clark	Home	7:00
23-25	MAIAW	WPI	

Wrestling

Date	Opponent	Home/Away	Time
November			
21	Brown	Away	7:00
30	Bowdoin	Home	7:30
December			
3	Trinity/Norwich/Bridgewater	Hartford, CT	12:30
6	Boston College	Home	7:00
10	*Harvard/William & Mary/UNH	Away	12:00
14	Plymouth State	Home	4:00
January			
14	RPI/Williams	Home	1:00
18	Amherst	Away	7:00
21	Rhode Island College	Away	1:00
24	Western New England	Away	7:30
28	Lowell	Home	2:00
February			
1	M.I.T.	Away	7:00
4	Wesleyan/Hartford/Potsdam	Home	1:00
7	Coast Guard Academy	Home	7:00

Varsity Swimming

Date	Opponent	Home/Away	Time
November			
30	Babson	Away	7:00
December			
2	Holy Cross	Away	7:00
7	Boston College	Home	7:00
13	Clark	Home	7:00
January			
21	Lowell	Away	2:00
28	Coast Guard Academy	Away	2:00
February			
4	S.E. Massachusetts University	Away	2:00
9	Trinity	Home	7:30
11	Tufts	Home	2:00
15	Bridgewater State	Away	7:00
18	Keene State	Home	2:00
22	Brandeis	Away	7:00

Winter Track

Date	Opponent	Home/Away	Time
November			
30	Tufts	Away	6:00
December			
3	*M.I.T./Brandeis	Away	1:00
10	Bentley	Away	1:00
February			
8	Holy Cross/Worcester State	Away	7:00

*Home Team

What You Think of Us: Results of the Alumni Readership Survey

One thing is clear: Our alumni readers have definite ideas on what they'd like to see in print.

By Kenneth McDonnell

Would you spend $5 for a subscription to the WPI *Journal*? Wonder how many of your fellow alumni would? We wondered about this ourselves and about a score of other topics concerning alumni attitudes toward two of the publications they receive regularly from their alma mater—the *Journal* and *Newsbriefs*, WPI's quarterly newsletter.

To explore readers' sentiments, we conducted a telephone survey earlier this year. For three evenings at the Alumni Office, some 75 student volunteers phoned a random sample of 600 alumni from a total alumni body of 14,756. In all, we completed 429 questionnaires, or 71 percent of our attempts.

Well, we found out how many of you think the *Journal* is worth a $5 subscription. And we also found out more about your needs and preferences for keeping in touch with WPI, your classmates and your friends from the days on Boynton Hill.

Here's how we conducted the study. First, we—the *Journal* and *Newsbriefs* staffs, the Alumni Publications Committee and the Alumni Office folks—decided what we wanted to learn and why. We felt that we ought to take a close look at what our alumni think of the *Journal* and *Newsbriefs*, so we can more accurately meet their needs.

Next we got the expert advice of Professors Joe Petrucelli and Sam Woolford of the Mathematics Department and Leonard Goodwin of the Social Sciences Department. They determined the size of our sample, reviewed our questionnaire and got us off on the right foot.

We recruited and trained our student phoners in the delicate science—and art—of attitudinal surveying. Their enthusiasm was fantastic! Then we all sat down at the phones and cranked out the calls.

The school's computer center "crunched" the numbers for us, and now we're reporting them to you.

A couple of technical notes: We divided our sample into four arbitrary age segments: the classes of '00–'37, '38–'52, '53–'67, and '68–'82. Incidentally, 43% of our living alumni come from the classes of '68–'82, 26% from '53–'67, 16% from '38–'52, and 14% from '00–'37.

The poll consisted of 22 questions, several with multiple items, making a total of 39 possible responses. A few open-ended questions were included, but most asked the sample to pick from a scale of possible answers.

Here's what we learned about the *Journal*—To verify our records, we asked our sample to tell us their occupations. Their responses (figures rounded) fell into the following broad categories: Engineering, 26%; Management, 17%; Sales/Marketing, 6%; Education, 4%; Manufacturing, 4%; Research & Development, 3%; Scientific, 2%; Retired, 13%; Other, 15%; No Response, 11%.

We looked first at alumni attitudes toward the *Journal* alone. Naturally, we were interested in learning how much time alumni spend reading the *Journal*. Here's what our sample told us: More than 52% say they usually spend a half-hour or more reading the *Journal*. A full 14% give the magazine more than an hour of their time. Not bad, we believe, for a magazine that arrives at their doors unsolicited and free of charge.

On the other hand, only 24% of our sample could recall an article that stood out as one they particularly liked.

We were eager to have our readers compare the quality of the *Journal* with alumni publications they receive from other colleges. Some 30% say that they receive such publications. Of these, 56% rated the *Journal* of better quality and another 27% judged it of the same quality.

We asked our sample how much they enjoy the following regular parts of the *Journal*: covers, "News from the Hill," features, student and faculty research reports, class notes, obituaries. It came as no surprise when a whopping 62% said they enjoyed class notes "very much" with another 17% enjoying them "somewhat." By a clear margin, class notes are the most popular section of the *Journal* according to the survey. Likewise, as we expected, the sample indicated least enjoyment in the obituaries section, "Completed Careers." The remaining sections collected "very much enjoyment" votes in the 25–30% range.

For planning purposes, we then asked our respondents to indicate their interest in story topics ranging from WPI building plans and finances, to profiles of prominent alumni and faculty, to the WPI Plan, to general interest articles, to WPI sports.

Here the responses varied tremendously. First and foremost,

the most popular articles appear to be those focusing on alumni. Then in descending order of interest: The WPI Plan, student projects and research, and campus building plans and renovations. Least popular appear to be stories addressing WPI finances, Alumni Fund reports and general interest stories—those that don't necessarily relate to WPI or its alumni. Of medium interest to the sample are stories about the Alumni Association, sports, current issues in higher education and letters to the editor. (We receive *very* few letters from our readers. Please write!)

These sentiments were borne out in a later, open-ended question that asked, "What would be the first thing you'd do to improve the *Journal*?" (Gulp!) Suggestions ranged far and wide, from "add more color" (prohibitively expensive), to "improve the writing," to "send it more often." (Nobody said, "Fire the editor!") But the message that came across loudest from this question was the sample readers' desire for a clearer and more prominent focus on alumni—through profiles, greater use of class notes and simply more space devoted to WPI graduates.

In another open-ended question, respondents were given the chance to make suggestions for *Journal* stories they'd like to see. Here, only 15% of the sample offered ideas. This, and the range of topics offered ("more on fraternities," "more sports," "effects of the Plan on business and society") indicated greater concern for personal interests rather than a common recognition that any particular areas of editorial coverage were felt to be grossly inadequate. But once again, stories about alumni headed the list of suggestions.

It's worth noting that no question in the survey directly addressed the Alumni Magazine Consortium (AMC), the five-college publishing arrangement of which WPI is a member. This was intentional. Under the AMC concept, the first and most successful of its kind, the middle 16 pages of each college's alumni magazine are identical and are thus more generic than the rest of the magazine (typically another 24 pages), which is produced by each member college.

Alumni comments during the survey about this format, adopted in early 1982 for financial reasons, were few and far between; and we heard no unusually strong sentiments for or against the idea.

Finally, the respondents' overall assessment of the *Journal* makes us feel pretty good. Forty-eight percent rated the *Journal* "outstanding," with another 35% judging it "average." Less than a full percentage point said we produced a "poor" magazine. The rest had no opinion.

What we learned about *Newsbriefs*: *Newsbriefs*, the quarterly newsletter of the college, receives far broader readership than the *Journal*. For one thing, we send *Newsbriefs* to some 4,500 parents of students and recent grads to help keep them informed of events and developments on campus and throughout the WPI community. (We also send the *Journal* free of charge to parents who request a subscription.) *Newsbriefs*, under the editorship of Public Relations Director Roger Perry, '45, also has a wider circulation among the media, neighbors of the college and Worcester-area community and business leaders.

Still, we are continually interested in reading the pulse of the *Newsbriefs* alumni audience. Our questionnaire unearthed some fascinating information. First, only 60% of the sample reported that they receive *Newsbriefs* regularly. But 55% say that they usually spend up to an hour reading *Newsbriefs*, with the majority spending up to one half-hour with it.

Some 53% rated *Newsbriefs* as "outstanding" or "average," though they were not asked to compare it with any other publication. And among those who do report receiving it, 87% rate *Newsbriefs* "outstanding."

Then we asked a hypothetical question: "Should *Newsbriefs* continue as a separate publication or become a special section of the *Journal*?" Nineteen percent said to leave it as a separate publication, 30% said the two should be combined, and 51% offered no opinion.

"How can we improve *Newsbriefs*?" we asked our sample of alumni readers. Suggestions ranged from "more on projects," to "too much about administrative matters," to "keep it coming." Again, as with the same question about the *Journal*, we turned up no clear consensus of how *Newsbriefs* needs to be changed dramatically.

What can we conclude from all this? The alumni leadership survey has certainly clarified a number of points. Above all, alumni appear to want the *Journal* to provide more information about their fellow alumni. They want to learn more about the WPI Plan, student projects and changes to WPI's physical plant. They care little of reading about administrative matters, WPI finances or general interest topics.

Yet a good many of them, nearly half, rate the *Journal* outstanding. Most say it's better than other alumni magazines they receive. Even more think it provides about the right *amount* of information.

Conclusions about *Newsbriefs* are more difficult to point out. We are puzzled as to why so many alumni in our sample report not receiving *Newsbriefs* regularly.

But alumni sentiments, though apparently not as positive towards *Newsbriefs* as the *Journal*, can be partly explained by the broader audience focus of *Newsbriefs*. Simply put, *Newsbriefs* must satisfy a far more diversified and larger audience than alumni alone.

Perhaps the ultimate question we must ask ourselves through the results of the survey is this: "Are our major communication vehicles for reaching our alumni—the *Journal* and *Newsbriefs*—meeting the needs of this vital constituency?"

Getting a close look at *Newsbriefs* on this level is tough, so diverse are its intended audiences and their interests. But, in the *Journal's* case and to a lesser extent in *Newsbriefs'* case, if the results of our recent survey of alumni readers represent the sentiments of the larger alumni body, we can answer with assurance that, yes, the *Journal* and *Newsbriefs* are meeting their goals. Yet we now also have a better idea of the course which alumni wish us to chart for WPI's two chief alumni publications.

And, yes, we did ask alumni if they'd subscribe to the *Journal*. Nearly 60% of our sample said they'd spend $5 for a year's worth of the *Journal*. Not that we are even considering such a move, but the question did provide a gauge of the *Journal*'s value to alumni.

Whether or not you were part of the sample, we'd appreciate hearing from you. Let us know what you'd like to see in the *Journal* and *Newsbriefs*, how you liked (or hated) a recent article, which way we should be headed.

And thanks to those alumni who offered us their opinions on the phone, the students who made the calls through three exciting evenings, the Alumni Publications Committee members who worked so diligently to produce a legitimate, comprehensive survey. Thanks especially to Deb Scott of the Alumni Office for her coordinating efforts, and to Publications Committee Chairman Don Ross, '54, and member Sam Mencow, '37, for manning the phones themselves: team players all!

Professor Robert L. Norton works with ME junior Richard Hajec of Granby, CT, on a WPI Applab computer.

Applab Flight 2610 Now Boarding

The passengers are WPI engineering students. Their destination: expertise in computer graphics.

by Michael Shanley
WPI News Bureau

You sit calmly, securely in the cockpit as the runway comes into view. The control tower and the terminal stand to the right. Everything is perfect as you begin your descent, the runway looming bigger and bigger. But wait. Something's wrong. Suddenly you're off course and heading straight for the terminal. Desperately you struggle to get back on course. But it's no use. Everything goes blank as you plow into the tower.

A scene from a disaster movie? A nightmare from which you'd gladly awaken? No. Rather, it's the graphic display being shown on ME Professor Robert Norton's Apple computer screen as part of his course, "Engineering Applications of Computer Graphics," ES2610.

If this were a video program designed by

experts to be bought and plugged into a home computer, the display might seem less than fascinating. It's not state-of-the-art computer graphics. What is fascinating is that the program was designed as a class project by Victor Geraci, '84 ME, using only the capabilities of an Apple II.

Geraci and his classmates learn to create computer images and make them appear 3-dimensional. They must master such concepts as animation, perspective, rotation and "hidden line" removal—deleting, for example, the "back side" of a 3-dimensional box.

"We're not interested in just making pretty engineering drawings," says Norton. "The idea is to do things in engineering graphics that couldn't be done before."

With that in mind, he sets out to teach basic principles that can be transferred to larger, more complex systems. "The mathematics doesn't change," Norton points out. "The program method the students design on the Apple will work on more advanced equipment they might use after they graduate," equipment which is already hard at work in the field.

The movies *Star Wars* and *TRON* both made use of computer graphics, Norton says. And at places like the Northrop Corporation's plant in California, test pilots are trained in simulators featuring detailed television pictures done by computer. Norton visited the Northrop facilities while attending an American Society of Engineering Education conference. "They're doing amazing things there—much better than *Star Wars*," he says.

But successful Hollywood producers and corporate giants have at their disposal multi-million-dollar equipment. WPI itself has an advanced computer-aided design (CAD) lab capable of performing complex maneuvers. And while their performance is spectacular, machines such as those in the CAD lab cost hundreds of thousands of dollars compared to $2,000 or so for an Apple II. "If money were no object," Norton says, "of course we'd opt for something more advanced."

Although WPI students have access to more than 100 computer terminals on campus, most of those are not capable of displaying graphics. There are just 15 Apple II computers in the WPI "Applab," and the 60 students in Norton's class must share those with other computer classes on campus.

Computer graphics is a new field for Norton. "I had taught computer programming to engineers since the 1960s, but the graphics part was brand new for me. I was supported on a Bay State Skills Grant and learned on my own, using manuals."

As a learning project, he designed an animated 3-dimensional graphics simulator for the Puma robot that is used as an industrial research tool at WPI's Manufacturing Engineering Applications Center (MEAC). On-screen, the viewer sees the robot—in perfect proportion—repeatedly pick up an object and move it to a spot in the foreground.

Wonder what it would be like to see the robot working from a bird's-eye view? No problem. Norton just punches a few keys and there you are looking down from the ceiling. How about a view from below? In a snap, you're peeking up at the robot as if from under a plexiglass floor. In fact, you can view the robot working from *any* perspective point simply by typing in the desired angle.

While Norton doesn't expect his students to produce anything quite so complex, many of them have created projects that combine technical knowledge with playful creativity. In addition to the airfield program noted above, students have created 3-dimensional slider-crank mechanisms, moving automobiles and even stage-by-stage displays of manufacturing processes.

Ingemar Handestam, an exchange student from Sweden, designed a program in which his initials, IH, in giant block letters, appear on stage from behind a "curtain," turn 180 degrees and then march off, disappearing again, as if animated, behind the curtain.

"It was great fun," says Ingemar with a grin. "After you learn the basics, it's fascinating to see how easy it is to make things 3-D. I even enjoyed writing the reports."

The reports are written papers Norton requires students to hand in with two of four mandatory projects. The reports describe the work and provide a "user's manual." Other than that, the course is paperless. Students hand in assignments on floppy discs and Norton corrects and grades them by plugging them into the Apple and letting them run. One requirement is that the program work with the viewer doing no more than occasionally touching a key to end a pause.

So except for the two reports, students are never required to use pencils or pens, papers or erasers. There are no exams.

"More and more companies are trying to manufacture and design products in a paper-less environment," Norton says. "It's quicker and easier and more productive."

Why, then, didn't he make his course completely paper-less; why the reports? "That's what a lot of the students wonder," says Norton with a chuckle.

Then he turns serious. "It's vital that engineers learn to express their ideas well. You can be the smartest person in the world, but no one will know it unless you can communicate. After 20 years in industry and teaching, I've found it's usually people with the best verbal skills—not just math skills—who get ahead." Having a well-rounded, broad-based background, Norton says, will also help keep graduates from becoming too provincial in their engineering practice.

As for computer graphics, Norton says, "Engineers typically aren't interested in pure computer science. An engineer looks at a computer and says 'What can I do with it?' Give him a start and he's off and running."

Running where? What is the future of computer graphics? What are the possibilities?

"Infinite," says Bob Norton.

Happy 25th Anniversary, Tech Old-Timers!

Here's a club that the years have only made stronger.

By Ruth Trask

Worcester Area College Computation Center Director J. Jackson briefs TOT members.

Back in the fall of '58, several members of the WPI Alumni Association thought it would be a good idea to form a club to "cultivate the comradeship" of older WPI alumni and staff members in the Worcester area. The club would act not only as a social catalyst, but also as a forum for the exchange of ideas on topics of community interest, general interest and, most importantly, campus interest.

Thus, the Tech Old-Timers Club (TOT) was officially launched on Dec. 11, 1958. And as the founding fathers had predicted, it was indeed a good idea. Over the years, membership has grown from the original 23 to the current enrollment of 200. This year the club celebrates its 25th anniversary.

It is through the meticulously kept minutes of Harrison Brown, '12, who served as secretary during 1958–74, that we learn much of the character of the early Tech Old-Timers Club. For example, if a member missed three meetings without a valid excuse, his name was stricken from the monthly mailing list.

Says Bob Fowler, '36, TOT's genial secretary-treasurer, "Can you imagine the uproar I'd cause if I took attendance today and tried to tie it to our mailing list? We sometimes have up to 70 members at a single meeting."

According to Fowler, who has researched club historical records, "The club operated quite independently from the Alumni Office early on. With annual dues of only $1, the club was apparently able to pay its own mailing costs and purchase its own letterheads and supplies."

The early, strict attendance requirement was relaxed when the Alumni Office started to help update the club's mailing list and assume some of its postage costs. Because of this assistance, TOT dues remained at $1 until they were finally raised to $2 in 1977, "due to inflation," quips Fowler.

TOT programs, normally scheduled for 10 a.m. on the second Thursday of the month, September through May, have been varied and interesting. Topics have ranged from "Problems of Aging and Life Expectancy" to "Urban Renewal in Worcester." On one early Ladies' Day, to which TOT members' spouses are invited, Mrs. Esther Goddard, widow of rocket pioneer Robert H. Goddard, '08, spoke on "The Road to the Stars," describing her husband's work.

In 1959 the club travelled to Boston by bus to see a Red Sox game. (Bus fare was $1.50. The outcome of the game was not recorded in the minutes.) Members have visited the Higgins Armory Museum and the Craft Center in Worcester. They've heard fishing and nature talks, participated in a campus hobby fair and laughed over a humorist's "Just Nonsense" program.

Members have enjoyed travel programs on Mexico, the U.S.S.R., Europe and the South Seas, yet news from the Hill has traditionally drawn the largest, most enthusiastic attendance. Former WPI Presi-

At a TOT meeting in the Gordon Library Conference Room (above), Howard A. Whittum, '34 (left) and TOT President George Garrison, '53 SIM, catch up on WPI. Below, Edward A. Sawtell (l.) and George H. Bartlett, both '38, chat.

dent Harry Storke gave a "WPI Today" talk in the 1960s. From his viewpoint, the new custom of wearing long hair and sideburns—so prevalent on Boston campuses at the time—had not yet reached as far west as Worcester. He reported on WPI's two female undergraduates and revealed that biology and computer courses might be added to the curriculum.

There were updates about athletics from Merl Norcross of the WPI Athletic Department and news of the then revolutionary WPI Plan from Dean William Grogan, '46.

Interest in highway safety led members to invite a former member of the Massachusetts Registry of Motor Vehicles to be

Tech Old-Timer Donald C. Vibber, '34, at a recent TOT meeting.

a guest speaker. He reported that he had encouraged school children to write jingles concerning highway safety. Out of the thousands he received, one of his favorites was: "Don't lose your head to gain a minute. You need your head, your brains are in it!"

"Getting the right men to serve as TOT officers has played an important part in the growth of the club," Fowler says. "Luck was with us in being able to attract capable members to lead the club since its inception."

Looking back over TOT's first 25 years, it's interesting to note that there have been 14 presidents, numerous vice presidents, and only three secretaries. Generally, the presidents served for a term of two years each, with the vice presidents then assuming the presidency.

Since 1977, the club has grown from 150 to 200 active members, and the average attendance at meetings has more than doubled, from about 25 to nearly 60.

"We believe this growth is due to good programming, aggressive leadership, guidance from the Alumni Office and the fact that alumni are simply living longer and enjoying more of what we have to offer," says Fowler. "TOT offers members the opportunity to meet with retired alumni, faculty and trustees on a common footing in an informal atmosphere. We share our varied interests and experiences, discuss common problems and benefit from programs on timely topics."

At May's meeting, the club initiated the practice of making awards to members in recognition of outstanding service to WPI and TOT. The first two awards were given to Chester Inman, '14, a charter member, and to Walter Dennen, '18, a former club president and long-time TOT booster.

Says Fowler, "The awards were appreciated and something of a surprise. They were long overdue."

Another factor in the growth and popularity of TOT is its fun-for-all atmosphere. Although some of the programs inspire serious thought, there is almost always room for laughter. "Any attempt at formality is summarily dismissed," Fowler adds.

Walt Dennen can always be counted on for his humorous perspectives on the current political scene when he makes an announcement.

The fun even extends to the recording of the minutes. This tongue-in-cheek entry appeared in the December 1959 records: "The minutes of the November meeting were not read due to the fact that they were not found. The motion was made and passed to omit the reading under those conditions."

Club membership expanded in the 1970s with the trend toward early retirement. But, due to uncertain economic conditions in the early 1980s, this trend seems to be reversing. Recently, TOT has enlisted new members from WPI's School of Industrial Management. Several SIM alumni now regularly attend meetings.

"In fact," Fowler reports, "the first SIM grad to become an active Tech Old-Timer is our newly installed president, George Garrison, '53 SIM."

On the eve of its Silver Anniversary, the Tech Old-Timers Club is hale and hearty. TOT is without question one of the most enthusiastic and loyal of all WPI clubs. It combines fun and purpose in equal measure for WPI alumni, staff members and trustees who are 65 and/or retired.

"We enjoy getting together," Fowler says. "We like to talk over what's going on in our lives and learn the latest developments at WPI and in the community. TOT provides us with a perfect forum."

With an ever-growing roster and spirited member endorsement, the Tech Old-Timers Club looks ahead to its next 25 years—and a Golden Anniversary.

Back in '58, the founders of TOT had a very good idea, indeed!

In Search of A Few Good Students

Already, the number of college-age students in the United States has dropped from its '70s high. By 1992, it will have fallen 25 percent. As competition for the best students gets tougher, colleges are changing their recruiting tactics.

By Mary Ruth Yoe

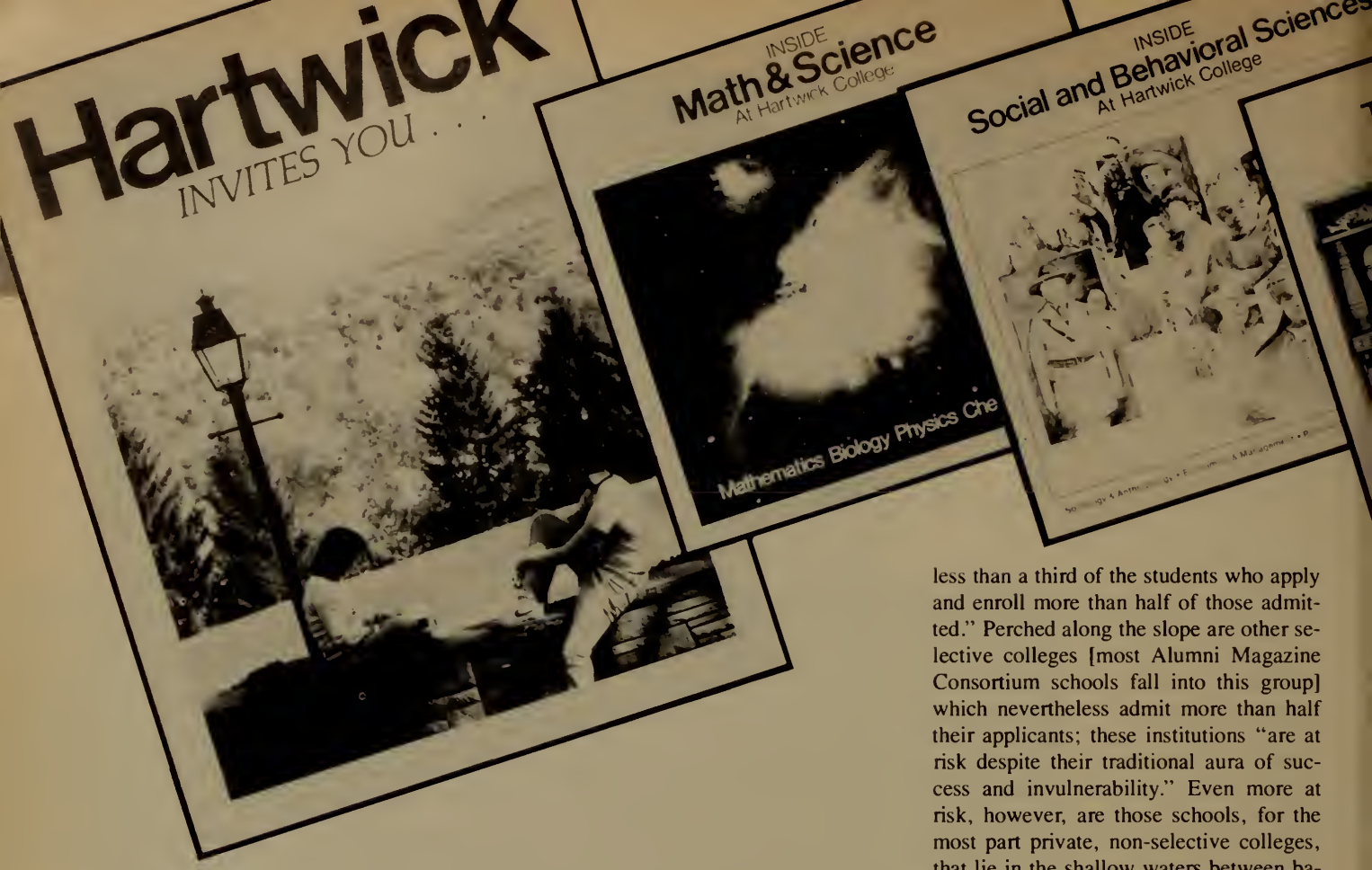
Since 1643, when Harvard College published a prospectus entitled "New England's First Fruit," colleges and universities have been inviting students to enroll. Sometimes the invitations are as sought after as admission to an exclusive country club. Sometimes they are more indiscriminate: during one spring break a few years ago, a college gave away Frisbees to revelers at Fort Lauderdale. Sometimes a descendent of that first brochure will stress challenging academics; sometimes, as did a Virginia women's college in the 1920s, it will boast that every bed in its dormitory is a Simmons.

Today's high school student with high SATs may receive 200 or 300 invitational brochures, part of increasingly orchestrated efforts by colleges and universities to market their (nonprofit) product to what is usually a first-time consumer: the 18-year-old high school graduate. It's a crowded, and sometimes confusing, marketplace: *The College Handbook 1982-83*, published by the College Entrance Examination Board, lists about 3,000 schools. Ronald Potier, director of admissions at Franklin and Marshall College, calls F&M "one of the most selective colleges in the country." (It accepts about 45 percent of its applicants; Princeton accepts 18 percent; 34 percent of the nation's colleges have "open-door" admissions.) But, he admits, "Still, we look a hell of a lot like other places."

"Students don't research colleges sufficiently well," says James Rogers, director of admissions at Brown University. "They go on hunch and hearsay." Christopher Small, dean of admissions at Rensselaer Polytechnic Institute (RPI), agrees: "Too many kids select schools because their next-door neighbor mentioned it, or their parents went there." Karyl Preston, associate director of admissions at Hartwick College, says she is surprised by students who enroll without visiting the campus: "Most people wouldn't buy a car without looking at it," she reasons, "or a dress without trying it on."

On the other hand, as Roy Seaberg, director of admissions at Worcester Polytechnic Institute (WPI), points out, students seem intuitively to match themselves to certain types of institutions: "There's a large amount of self-selection." In *The Structure of College Choice* (published in September by the College Board), Robert Zemsky and Penney Oedel divide students into four categories: local, in-state, regional, and national. Institutions are similarly classified, depending on the type of student they most often attract. (The four Alumni Magazine Consortium institutions surveyed in this article—F&M, Hartwick, RPI, and WPI—fall along the regional spectrum.) "We can say with some confidence," the researchers write, "that the most important single attribute for identifying regional and national students is a high SAT score, followed by college-educated parents, high family income, and post-baccalaureate aspirations."

Zemsky and Oedel (of the Higher Education Finance Research Institute at the



University of Pennsylvania) make no claims to special insight. They say they have merely quantified what admissions officers intuitively knew: each institution attracts a certain type of student. In the 1960s, an institution's admissions officer functioned as a gatekeeper, content to let the student decide on his or her own if X University was the place to attend. Now, gatekeeper has become recruiter.

The reason for the change is what one educator calls "a 15-year window of vulnerability," declines in college enrollment brought on by the end of the post-World War II baby boom. Between 1979 and 1992, predicts the U.S. Census Bureau, the number of 18-year-olds will drop from 4.3 million to 3.2 million—a drop of 25 percent in the population group known to college admissions officials as "the applicant pool." (By 1996, things may begin to get better, in part because children of the post-World War II baby boom children will near college age.) The news is particularly bad for institutions in the Northeast and North Central states, regions hard-hit by migrations to the Sunbelt where the drops are expected to be nearer 40 and 30 percent, respectively.

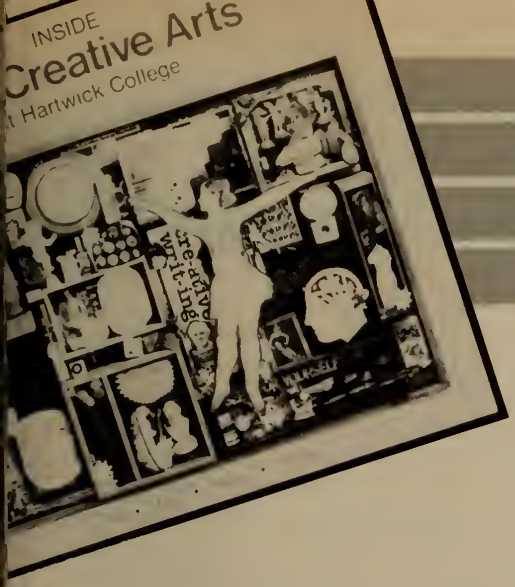
But simple demographics don't tell the whole story. The number of 18-year-olds doesn't necessarily equal the number of high school graduates. In 1977, for example, 83.9 percent of whites aged 18 to 24 graduated from high school, compared to 69.8 percent of blacks and 55.5 percent of Hispanics. The proportion of minorities in the college age group is increasing. That fact, in addition to increasing tuition and uncertain employment prospects after college, may further lower the applicant pool.

Although the writing on the wall dates to the early 1970s, it has taken many colleges and universities longer to get the message. David W. Breneman, the new president of Michigan's Kalamazoo College, notes in *Change* magazine that "a recent national survey of college and university presidents reported that only 16 percent of the presidents expected their institutions to lose enrollments, while 42 percent expect their enrollment to increase!"

Robert Zemsky and Penney Oedel think the metaphor of an applicant "pool" with its "single surface...hides the fact that in reality there are a series of linked basins carved out of the pool's uneven bottom." (The researchers assign separate basins to private and public institutions, believing the two compete for different types of students.) Only a very few institutions are safely moored in the center of a deep, steeply sloped basin: schools [like Harvard and Stanford] which "traditionally admit less than a third of the students who apply and enroll more than half of those admitted." Perched along the slope are other selective colleges [most Alumni Magazine Consortium schools fall into this group] which nevertheless admit more than half their applicants; these institutions "are at risk despite their traditional aura of success and invulnerability." Even more at risk, however, are those schools, for the most part private, non-selective colleges, that lie in the shallow waters between basins. As the pool begins to lose volume, warn Zemsky and Oedel, those institutions "will be most exposed."

Whatever an institution's position in the pool, the water level is going down. "Most admissions officers," says Robert Zemsky, "will end up telling their academic and financial officers something like this: 'What we must face is that in five years there will be fewer students of the appropriate age. We're not going over a precipice. Institutions will not commit hari-kari en masse. But there is going to be a boil-down.'"

As the pool of traditional college-age students decreases, some educators reason that institutions should focus their efforts on nontraditional students—men and women over the age of 24, minority students, foreign students, continuing education students, students now served by industry-run schools. For many schools, this is easier said than done. "One disadvantage in a rural area," Hartwick's Karyl Preston points out, "is that you really don't have recourse to the alternative of nontraditional education—there's just not as much interest in it as there is in urban areas, where industries are often willing to support it." Robert Zemsky agrees: "You have to ask your-



Hartwick College, located in upstate New York, sees its physical setting as inviting, a marketing asset. Publications are designed to emphasize the variety of courses and majors.

self, 'Are we doing it now?' If so, you've got a chance." The schools with the best chance to jump on the nontraditional education bandwagon, he says, are community colleges; besides their typically urban or suburban location, "they're built to take advantage of the piecework and heavy part-time nature of the venture."

So selective colleges and universities, fighting to keep their perch in the diminishing market, have to concentrate on the traditional student. As competition increases for the best and brightest of those students, some institutions are considering a slight, voluntary reduction in enrollment, to avoid sacrificing quality for quantity. Smith College decided this year gradually to reduce the size of its student body by 10 percent. A similar, hypothetical contraction will be studied in a marketing research survey at Worcester Polytechnic Institute this year, says Director of Admissions Roy Seaberg.

"We dealt with that issue even before it became an issue," says Ronald Potier of F&M. In the early 1970s, his college had an enrollment of 2,150 students crowding its "somewhat landlocked" campus. The decision was made to contract to an enrollment of about 2,000. Potier thinks that F&M's status as an undergraduate institution made cutting the enrollment easier: "In our case, as opposed to a school like Johns Hopkins or RPI—where the undergraduates are paying for a part of the graduate structure—we have far, far more flexibility."

Flexibility in planning is needed, because conditions change quickly. Three years ago, when Christopher Small prepared a demographic study for RPI, "even the best-of-all-worlds scenario showed that we were going to experience a drop in enrollment. But I didn't take into account at that time that there would be a tremendous boom in technology." Then there's the case of the related drop in graduate applications in engineering, "a phenomenon that may have reversed itself" as the market for recent graduates has faltered. Says Small, "This year there's been a 40 percent increase in graduate applications"—which means an increase, though smaller, in enrollment.

To maintain both enrollment and quality—or to maintain, or even to increase, quality while decreasing enrollment—institutions have only one choice: to beef up their admissions efforts. And they are. The average institution of higher education, according to a survey commissioned by *The Chronicle of Higher Education* (May 4, 1983), budgeted $298,439 in 1982–83 for admissions, 8 percent more than the previous year and 23 percent more than in 1980–81. And although the budgets included such major expenditures as salaries, travel, postage, printing, supplies, and telephone costs, the figures may be conservative: hidden costs such as computer time and admissions publications subsidized by other departments don't show up in the survey.

According to *The Chronicle*, selective liberal arts colleges planned to spend the most per enrolled student in 1982–83, an average of $709. (F&M says the amount it spent is "a little lower," while Hartwick admits to being "a bit above," and Brown "hit the average almost on the nose.") For an entering class of 500, say, that means an admissions budget of about $350,000. On the average, private research universities budgeted less—$374—per enrolled student (RPI spent about $460; as an undergraduate engineering school, WPI spent about $510.)

Travel is the highest single item (excluding salaries) in the admissions budget of both private research universities and selective liberal arts colleges. "Roadshows"—college fairs and college nights, held in urban and surburban schools and motels—generate large numbers of student inquiries. Visits to individual high schools, meanwhile, have lost some of their former importance. "The high school visit as a source of initial contact is useless," notes Chris Small, "but it is a must as an opportunity to tell people what you're doing and to see people on your inquiry list." Ron Potier agrees: "I don't think many people are prepared to write it off. But the fact is, if you're not known to start off with, you can take yourself all over the country and still not talk to anybody. It's word-of-mouth reputation that matters."

Enter direct mail. Remember the 200 or so promotional brochures sent to the bright high school junior with high SATs? More and more institutions make their initial, often unsolicited, approach to prospective students through mass mailings. (Postage and printing costs seem to be the fastest-growing items in the average admissions budget.) About 900 colleges and universities purchase lists of names from the Student Search Service of the College Entrance Board. The Board asks students taking PSATs or SATs to complete a form that includes questions on personal background, achievements, and goals. Students can then be targeted by test scores, ZIP code, ethnic background, expected major—so that, for example, a school can request a list of female engineering students in California with math SATs above 600. For approximately $150 per target area, plus $.14 per name, the Student Search Service will sell names from its 1.5 million-student pool. (Last year, Boston University, one of the Service's five largest customers, bought 218,000 names.)

How effective is direct mail? It depends on both the school and the goal. For a college with an already firm national reputation, says James Rogers of Brown University, direct mail may be counter-productive: "A very competitive college tends to diminish the institutional luster by joining many other colleges, some that students and parents have never heard of, in the mail slot." (Without using direct mail, Brown had 13,280 applicants this year, and accepted fewer than one student in five.) But, to a small liberal arts college, getting greater exposure may be the

RPI's outsize red logo appears on most admissions pieces—for impact and to show strength and stability.

first step in increasing applications.

"We have been fairly heavy users of the Search for the last five years," says Karyl Preston of Hartwick, "buying about 95,000 names per year. We were trying to present Hartwick to more people, trying to make it a bit more of a household word." This year, Hartwick cut back on the number of names it bought—to about 48,000—and, says Preston, "We're now targeting in, homing in on specific counties in four of the eight original search states which have traditionally given us a good rate of inquiries to apps to paids." (In admissions lingo, an app is, of course, an applicant, and a paid is an accepted student who decides to enroll.) By targeting more closely, Hartwick hopes to improve its yield from the search.

Inquiries from a search mailing are, by their nature, "soft inquiries," says F&M's Ron Potier, "because they're not totally self-initiated." Although F&M buys about 40,000 names a year, "our major yield is from people who have heard about F&M from other sources and who sit down and write a letter and put a stamp on it."

RPI and WPI both target for students with high math scores and an interest in engineering and science. RPI buys 45,000 names; WPI, 15,000.

Some professional admissions groups argue that each school should limit itself to a single unsolicited contact, but most schools currently do more. "The most common mistake schools make in direct mail is that they send too much of it," says Small. "The better the focus, the more success." It's hard to know how many glossy brochures, admissions newsletters, or personalized computer letters a kid can receive without feeling hounded rather than honored. "Some of them enjoy it," notes Small. "There's a tremendous amount of waste in this, but there is in all advertising."

To avoid that wasted effort, institutions have turned to market research. As with a commercial firm planning to introduce a new product, the first step is a self-study. A college, says Robert Zemsky, "should be asking, 'Who am I?' It's often asked intuitively, but it should be asked more rigorously." The result is positioning, the carving out of a small, distinctive niche in the marketplace.

The niche will, of course, vary from school to school. Hartwick College, for example, has decided that there will always be a cadre of people who want to attend small private liberal arts colleges in non-urban areas, and wants to concentrate on students who want a good, but not high-pressure education in an attractive rural setting: "Hartwick is not an intimidating place, academically or socially," says Karyl Preston.

At WPI, Roy Seaberg sees "forces at work at engineering and technological colleges that don't operate in liberal arts colleges. First, there is society's perception that we're now in a much more technologically oriented era. Opposing that is the view that technology is much more unfeeling than the liberal arts. But, with our emphasis on the humanities and individualization, we're in a good position. There's a role for this college in the future that may be more significant for students other than our usual applicant pool—for liberal arts types who want to know technology." He pauses. "Our job is to get that message out there."

Sometimes the niche is more a matter of where the institution wants to be. Franklin and Marshall College enjoys a strong regional reputation, says Ronald Potier, "and we've got to expand our horizons. F&M is right on the border of being a national institution, but it isn't there." With that in mind, he says, "We're going to Houston, St. Louis, Dallas—places where the population isn't dropping off as fast."

And at RPI, although "in terms of the number of applicants with high math scores for the number of available spots, we're among the 25 most select schools in the country," Chris Small wants to see RPI on a more equal standing with Cornell and M.I.T.—currently, students accepted by both RPI and one of those institutions most often decline the RPI offer. While Small admits that "we're on a roll at the moment" as far as the number of applicants to the School of Engineering is concerned, he'd also like to increase the number of applicants to RPI's four other schools (Architecture, Humanities and Social Sciences, Management, and Science).

Determining the kinds of students it has traditionally attracted helps an institution plan its future marketing efforts. One element that each must put into its calculation is the demographic drop. "Let's face it," says Roy Seaberg of WPI, "we've got a 40 percent decline in the states—New England, Middle Atlantic, the Upper Plains—from which 50 percent of the engineering students in the U.S. are drawn."

F&M's colonial past colors its warm, conversational, and traditional look.

With 67 percent of WPI's students coming from Massachusetts and Connecticut, Seaberg says, "It's obvious that we're going to have to broaden our geographic base. This is easier said than done, because moving out of New England means first moving into areas contiguous to New England—and they also are experiencing the drop in high-school graduates. We'll be looking at the Sunbelt, the Southwest, too, but there our relative anonymity will be a problem at first."

"It takes three to five years to really develop a new area," says Hartwick's Karyl Preston. "The realization that we do well in suburban areas has given us some new marketplaces: suburban Ohio, Chicago, Baltimore-Washington. Although we've been a regional institution, with the numbers dropping off, we need to start testing the waters in select new areas. First studies, then getting search names."

In addition to expanding horizons, institutions may decide to work the tried-and-true streams harder. About 75 percent of Franklin and Marshall's students come from New York, New Jersey, and Pennsylvania. Despite a predicted 40 percent drop, says Ronald Potier, "That *is* our market. We're known in those areas, so it doesn't mean there will be a 40 percent drop in interest in F&M." RPI is pursuing a similar strategy in New York State and New England, focusing more attention "on different markets in those states. We have a real problem in being thought of as an engineering undergraduate school. We could deal with a 50 percent drop in applications for engineering, but we couldn't face the same drop for our other four schools. So we're trying to take that story to the area. That's new."

Also relatively new is cooperative recruiting. There's some debate about the concept: on the one hand, it means less duplication of effort, and it can be a way for schools from the same region to enter a faraway market with a minimum of effort. On the other hand, schools emphasize their individuality, and a student hearing about three liberal-arts colleges in Pennsylvania in one day, for example, might find it hard to distinguish among F&M, Dickinson, and Gettysburg. F&M does belong to such a consortium: "It's most useful in faraway places," says Potier, "where each of us has certain strengths. But it does tend to homogenize our products."

F&M also belongs to the Keystone Admissions Group, 13 private colleges in Pennsylvania that travel cooperatively, especially in Puerto Rico. "We try to sell Pennsylvania as a place where there's a lot happening in education." Besides saving money for its members, the group annually yields about 30 to 40 applicants to F&M, of whom about six to eight enroll. "But it's not a matter of getting bodies," Potier is quick to add. "I could go to Teaneck, New Jersey, and get bodies. These kids are bilingual—often trilingual—any good college should be trying to get a cosmopolitan group." And, for the past decade, F&M has traveled with other East Coast colleges to eight or nine major European cities each year; this year, WPI will join the group. "Most of the kids we'll see," says Potier, "are carrying American passports." Of the 20 or so schools involved, institutional types seldom overlap.

No overlap, no direct competition. Any admissions officer worth his salt can reel off the names of his institution's competitors, often in 1-2-3-4 ranking. Sometimes the information is intuitive, sometimes it is couched in terms of precise win-loss totals: "Of students accepted by both RPI and M.I.T.," says Chris Small, "we lose eight out of ten to M.I.T."

All too often, says Robert Zemsky, schools have their eyes on the wrong competitors: "They focus on the big heavy-hitters against them, they focus on where they lose—not on where they win—or if those winning markets are at risk." Zemsky and his colleagues at the Higher Education Finance Institute have developed a market model, to be implemented by the College Board next year, that will help a college see how it is doing in the entire complex of market segments. In the case of an engineering school like RPI or WPI, Zemsky says, "those markets need

to have some SAT weight, a fair concentration of engineering students, and a fair concentration of high- or middle-income families." The proposed service "will produce lists of top markets for people, who can then ask, 'Are those top 15 markets good markets for me? If not, why not?'"

Many schools are already asking these questions. To find out why accepted students choose to attend—or not to attend—their institutions, many schools send such applicants detailed questionnaires. Although the response rate is usually good, the results, as Hartwick's Karyl Preston points out, have to be taken with a grain of salt: "The survey is done over the summer, and there is a problem: Students are somewhat removed from their thinking processes in making the decision to attend or not." Still, a school may discover, as RPI did, that its Troy location was perceived as dull and grimy (current publications work to counteract that image). Carleton College in Minnesota discovered from its survey that many students who had decided not to enroll felt the school's library was inadequate. Mystified, the admissions staff took a close look at the viewbook—and discovered that the library was shown from the back. Terraced into a hill, it looked only two stories high. They replaced it with a frontal view—showing all four stories.

As the applicant pool diminishes, tuition—in both private and public sectors—is increasing. "A year at college," says Jerrold Footlick, a senior editor at *Newsweek,* "has always cost what a new Chevrolet cost." But as the price of a new Chevrolet rises, private colleges—where a year costs about the same as a Chevrolet with a lot of options—worry that students will opt for a public education, simply because of price. "I think most private colleges are finding that more and more of their applicants are applying to at least one state institution," says Karyl Preston, "particularly those students who are applying for financial aid. They're hedging their bets, so if financial aid doesn't come through, they still have an option." Roy Seaberg agrees. "Cost is not a factor in the decision to matriculate at WPI in respect to competition with our private competitors. That is not true for our public competitors."

"I can't help but think that there are going to be more and more families who opt for public schools, simply based on price," says Chris Small at RPI. "More and more, there will be a lot of rich, not so bright kids at private institutions."

WPI's window collage of images reflects the comprehensive nature of a technological education.

But not everyone predicts a public-private showdown. "There's going to be competition between the publics and the publics, and the privates and the privates," says F&M's Ron Potier. "We just don't cross. People position themselves very early. Mom and Dad and the kid sit there, and Mom and Dad say, 'We can't afford $10,000 a year'—and a decision is made. The kid will apply to public schools."

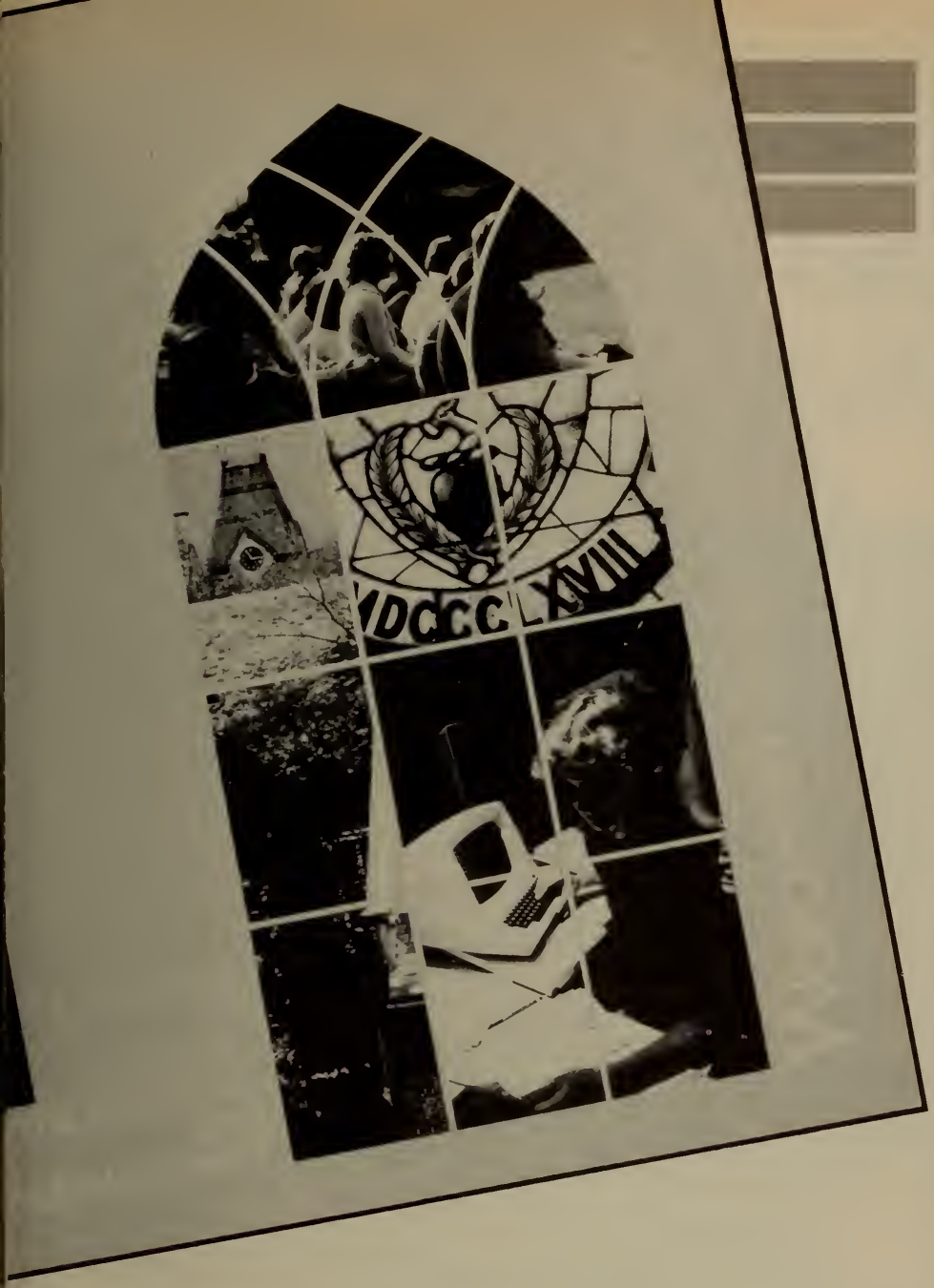
Robert Zemsky goes one step further. Not only don't private and public sector compete; they can't: "F&M and schools like it can't out-compete the publics by looking like a public. They must continue to charge high enough tuitions to continue the same quality of education that produced their reputations."

"I think we're at the beginning crest of a fundamental change in how we finance higher education," Zemsky adds. "Paying for college is a ten-year proposition. You really need extended, installment-like paying plans." (Witness the Chevrolet.) What Zemsky hopes will emerge are "higher education banking institutions, to provide—at the lowest rate—capital for students to finance their education." The University of Pennsylvania, for example, plans to offer its students (and their parents) a series of payment schedules: A parent who can pre-pay the student's entire tuition gets a 5 percent discount; paying the first year in a lump sum means a family can take up to ten years to pay the remainder—at the first-year cost, and with a 1-percent finance charge. Designed to appeal to families earning $35,000 or more, these plans are straightforward price discounts.

Price discounts, in the form of need-based scholarships, are a more traditional staple of the private college system. "Financial aid," says Chris Small, "is nothing more than a pricing mechanism. Without financial aid, the average market of students would be 80 percent smaller for most institutions." Indeed, an institution's announcement of a tuition increase is almost always accompanied by a notice that the amount of financial aid to be divided among the students will also expand.

"The way a lot of colleges—not F&M—get financial aid," says Ron Potier, "is out of current operating expenses. If you have a child paying $10,000 and I have one paying $4,000, part of what you're paying for is to finance my kid. Can a college do this morally?" The answer, at least on the part of such institutions, has been Yes.

Today another traditional kind of price discounting—no-need or merit awards—has raised similar questions. Such merit scholarships have been around for years: RPI has recognized the top student in science and engineering at 1,500 U.S. high schools with a medal (and are automatically considered for a $1000 no-need scholarship) since the turn of the century. RPI also has alumni scholarships and a special honors program called the Pro-



vost's Scholarships. At Hartwick, about 40 no-need scholarships are given each year, some on academic merit, some to recognize student leaders. F&M and WPI, on the other hand, have only need-based aid, and neither Ron Potier nor Roy Seaberg foresees a shift in policy.

But this year, no-need grants made headlines even outside the academic world. Part of the fuss began this spring, when Smith and Mount Holyoke announced plans to award $300 and $400 grants for academic excellence, with no consideration of a student's need. Although the amounts were token (tuition at Mount Holyoke is nearing $9,000), other educators were alarmed. Walter H. Moulton, director of financial aid at Bowdoin College, told *The Chronicle of Higher Education*, "if institutions of the caliber of Smith and Mount Holyoke start down the road, those institutions having more difficulty recruiting students will be inclined to follow at a higher level of award. . . . The price eventually will have to be paid by the needy student."

Many people agreed with Moulton, and this fall, both Smith and Mount Holyoke dropped the scholarships, saying that they hadn't been as effective as they'd hoped. Of Smith and Mount Holyoke's hesitant excursion into merit scholarships, Ron Potier says, "The way they did it was like being a little bit pregnant. They compromised themselves for nickels and dimes." Meanwhile, Brandeis University, which offered four-year no-need scholarships of $2,500 to $4,000 to its 100 most sought after applicants, is pleased with the results: about 30 percent of those applicants decided to attend Brandeis this fall—compared to about 12 percent last year.

Some admissions officers feel that no-need scholarships benefit neither school nor student. "They further distort the college selection process," says Chris Small. "The kids have a hard enough choice without the school tossing in another 5,000 bucks." Roy Seaberg says the price-war aspect of merit scholarships isn't fair to students, either: "We're seeing merit scholarships offered for full tuition with a two-week deadline. That is against standard admissions practice [May 1 is the common reply date, when an accepted applicant must let all colleges know of his plans]. When a merit scholarship is offered with a two-week deadline, a student may plunk down the tuition deposit for his second-choice school to play it safe." (If, later, he's accepted by the college he prefers, he has lost the earlier deposit.)

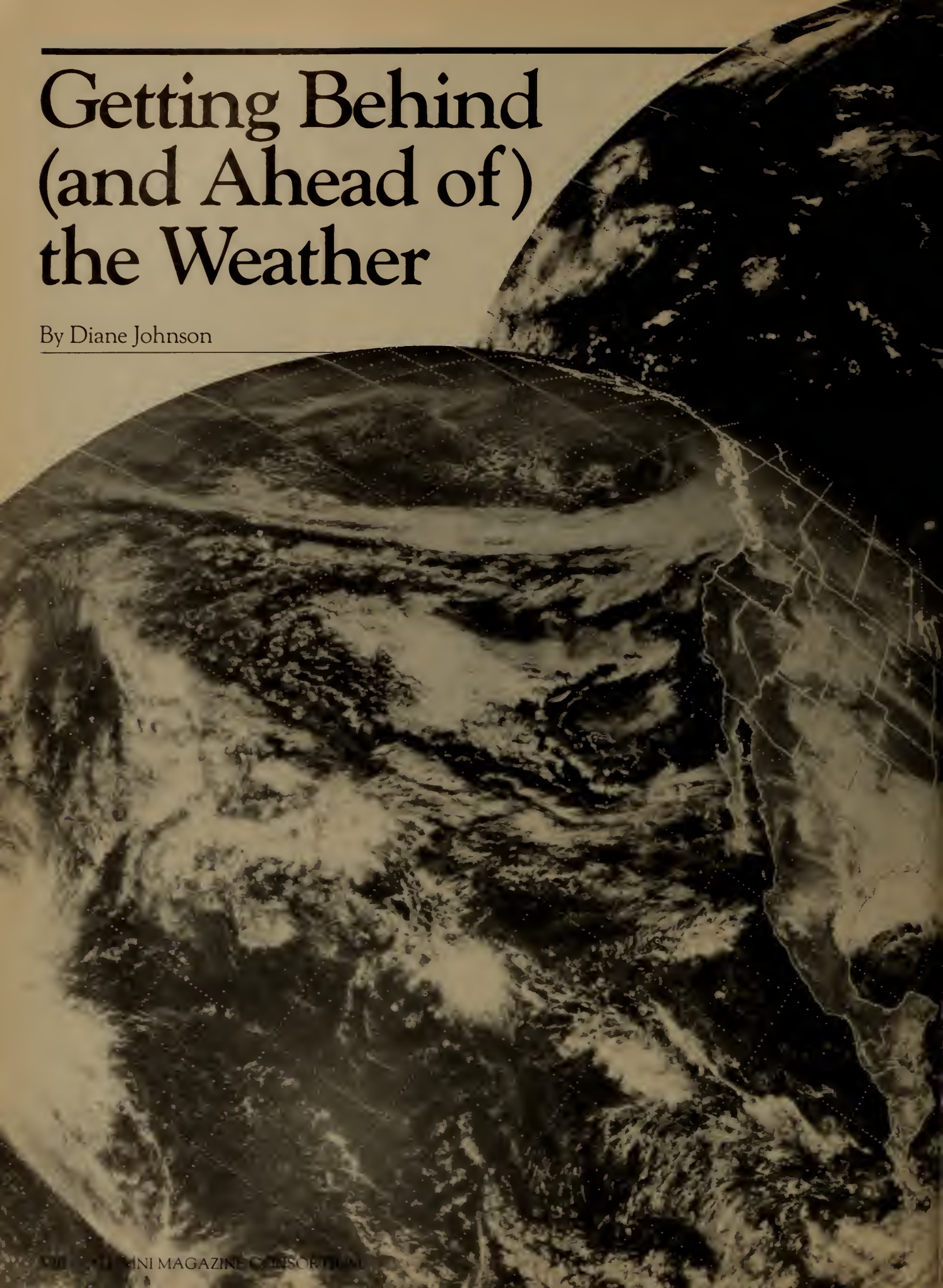
But how many students pick their second-choice school because it offers them a no-need grant? Chris Small isn't sure: "A kid isn't going to come to RPI rather than M.I.T. simply because we gave him a $1,000 scholarship. But because we only offer merit awards to the really top kids, there is a strong probability of just such an M.I.T. or Ivy overlap." Hartwick's Karyl Preston agrees: "I'm not sure a no-need scholarship is going to buy students who really want to attend another college—I think it's just one other factor thrown in the hopper."

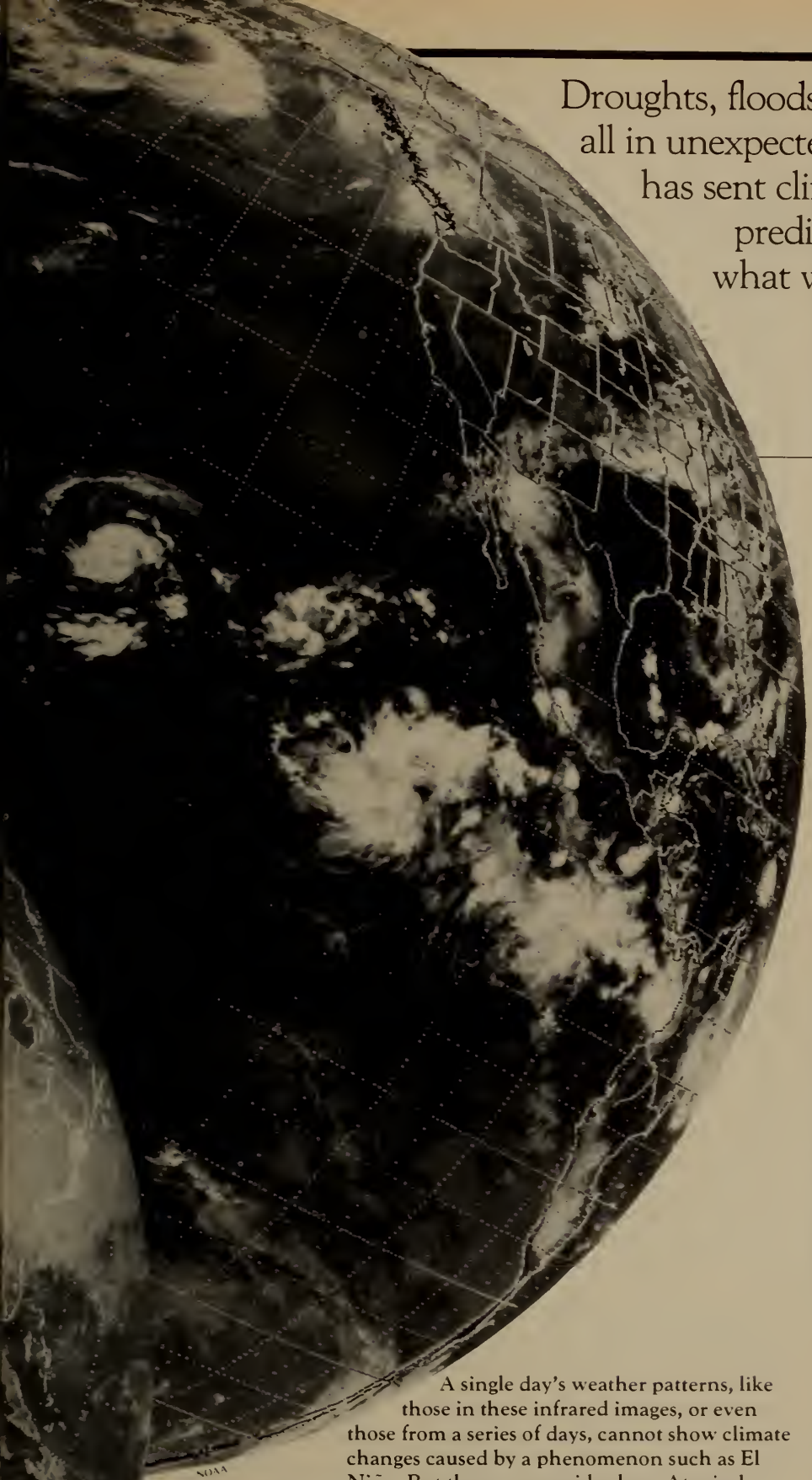
When Roy Seaberg applied to WPI in 1952, he remembers, "There was one person who was director of admissions and also dean of students. He had one secretary." Today, the average admissions staff at a private liberal arts college numbers 5.9 professionals, 5.7 clerical workers. At the average private research university, there are 4 professionals, 6.2 clerical workers.

But if there has been a change in size, a change in methods, a change in jargon, most admissions officers still see themselves as gatekeepers, admitting those students who will most benefit—as well as benefit from—the institution. They want to *keep* the students they admit. "We still resist advertising," says one. "We like to think that our best advertising is the word-of-mouth recommendation."

Getting Behind (and Ahead of) the Weather

By Diane Johnson





A single day's weather patterns, like those in these infrared images, or even those from a series of days, cannot show climate changes caused by a phenomenon such as El Niño. But they can provide clues. Atypical weather attributed to the unusually warm Pacific current includes such things as the storm system brewing near Tahiti (almost due south of Hawaii) in December 1982.

Droughts, floods, blizzards, heat waves—all in unexpected places. 1983's weather has sent climatologists back to their predictive models, wondering what went wrong. Meanwhile, meteorologists work to perfect their forecasting equipment and skills.

This year, worldwide, the weather is out-of-whack. Here in the U.S., a wet winter lingered longer than usual, well into spring. Then summer hit with a vengeance, creating a drought which has caused serious grain shortfalls.

An unprecedented drought has also parched Australia, while torrential rains caused massive flooding and mudslides in Peru, Ecuador, and Bolivia. Europe's heat wave baked natives and summer tourists alike.

Most of us have been taking Mother Nature's punches one at a time, from blizzards to broiling temperatures. But meteorologists are preparing for a major change in forecasting the weather we experience while climatological researchers are taking a longer view, looking at what makes the erratic weather happen.

Until this year, climatologists were beginning to believe they had a handle on what determines the aggregate of weather we call the Earth's climate. Their primary tools are mathematical models—computer-generated twin earths which mathematically describe the motions of the atmosphere and oceans, the exchange of heat and energy that makes for the relatively orderly changes each year from winter to spring, summer to fall.

Using historical data, the models allow researchers to compare theories about what caused past warmings and subsequent ice ages. Historical data also provide clues to understanding if the Earth is gradually warming up, from the "greenhouse effect" of increasing carbon dioxide in the atmosphere. Responding to a diminished output from the sun. Or experiencing a small bump in the emerging pattern of global changes in temperature, in weather, or in climate, which have taken the Earth

Pulsing energy into the atmosphere at very short intervals, Doppler radar receives information from the echoes reflected by water droplets and ice crystals contained in a storm. Above, in a detail from a Doppler multimoment display, vector arrows indicate both the intensity (reflectivity) and velocity of those particles. The rotary circulation is a mesocyclone, the parent circulation of a tornado.

through ice ages and interglacial warming periods.

This year seems to be revealing a discomforting fact. The predictive models aren't working. The debate about why history has failed to predict the present weather aberrations centers on two major culprits—affectionately dubbed "The Big Es"—El Niño and El Chichón, the ocean current and the volcano.

"Nature gave us the two greatest gifts this year—El Niño and El Chichón," said Stephen Schneider, a climatologist at the National Center for Atmospheric Research. "But why did she have to give us the two biggest at the same time? It makes it much more confusing to sort out."

El Niño has been a misbehaving child for a while now. The Pacific current which sporadically rises off the coast of Peru and Ecuador bears the Spanish name for the Christ Child because it usually occurs around Christmas. Every eight to ten years, El Niño grows more intense than usual, and its nutrient-poor waters destroy the rich coastal fishing. But this El Niño is a record-breaker: The current has been running 12 to 15 degrees warmer than usual for more than a year.

In the complex web of interactions of air and ocean surfaces, the warm-running El Niño is connected to a failure of the equatorial trade winds that normally push warm waters away from the South American coastline into the broad reaches of the western Pacific. Without the driving force of the trade winds, the warm water sloshes back like water in a giant basin, pushing against the coasts of Ecuador and Peru, bringing rain to normally dry areas.

The current's "misbehavior" and the diminished trade winds have triggered a mini-reversal of weather. Arid regions in Bolivia, as well as in Ecuador and Peru, have received more than 100 times their usual moisture. On the other end of the see saw, Indonesia, the Philippines, and Australia—which usually garner the rainfall—now have droughts. The dryness has moved to Sri Lanka, southern India, and Africa.

Oceanographers especially are inclined to blame El Niño for all the current weather woes. Others sound a cautionary note.

"El Niño is a code word . . . a symptom of broader variations we don't understand. World wide there's anomalous weather produced by a complex set of circumstances," according to meteorologist George Benton of the University Corporation for Atmospheric Research. "I doubt they can all be tracked down to ocean temperature anomalies and atmosphere-ocean circulation patterns."

Sorting out cause-and-effect in the delicate balance of heat and moisture between the vast, slow-moving ocean and the spinning atmosphere would be hard enough. But then there's El Chichón to contend with.

When the Mexican volcano erupted in April 1982, it made history as one of the century's most significant outbursts. Situated near the equator, El Chichón's outpourings of acid and ash were taken high into the atmosphere and circulated around the globe.

It exploded with enough force to send tons of debris about 26 miles into the stratosphere. (Mt. St. Helens, by contrast, reached less than 12 miles high.) Within a month, El Chichón's volcanic veil had crept over most of the Northern Hemisphere. While most heavy ash particles fell to earth relatively quickly, what still remains aloft is largely a layer of fine particles of sulfuric acid, ash, and salt. (Just to make things interesting, El Chichón was sitting over a natural salt dome when it blew.)

Acid and sodium chloride can play hob with the chemical equilibrium of the stratospheric ozone layer. The naturally occurring layer of ozone not only shields Earth from harmful solar ultraviolet but

Weather Research

Weather does influence behavior—in both animals and humans. How much, though, is not clear. Scientific proof is hard to come by, anecdotal evidence voluminous.

Fiddler crabs, for example, have been observed to retreat to inland burrows days before a hurricane's arrival. Horses are more apt to bolt in stormy weather. Loggers in the Pacific Northwest are said to predict snow two or three days before a blizzard by watching the gathering of elk in the shelter of trees.

Among humans, a falling barometer has been blamed for everything from fainting spells and headaches to domestic squabbles and suicides. Certain dry winds so notorious they have earned distinctive names—like the Foehn in Bavaria and the Chinook that blows down the eastern slopes of the Rocky Mountains—have been blamed for traffic accidents, short tempers, and embolisms, among other things. And enough people think "positive ions" in the air are bad for one's health

also plays a role in maintaining the Earth's temperature. A layer of particles at stratospheric height provides a tattered umbrella, bouncing some of the sun's rays back into space before they reach the Earth's surface. Thus, according to global climate models, a volcanic cloud can reduce the world's average temperature from a quarter of a degree to two degrees (C).

When Mt. Tambora erupted in Indonesia in 1815, it left an interesting global legacy; New England farmers dubbed the following year "the year without a summer." June and July brought frosts, wreaking havoc with crops and creating what scholars have identified as "the last great subsistence crisis" in Europe.

Painting his famous, multi-hued sunsets during those years, Joseph Mallord William Turner wasn't indulging in fanciful artistic visions, but faithfully representing the brilliant skies colored by the earth-circling cloud from Tambora. Volcanic dusts adds spectacular, luminous colors to sunrises and sunsets, a gentle finale to the violent rage of an eruption.

Recent research hints at another intriguing piece of Tambora's bequest, Stephen Schneider said. While Turner was painting his sunsets and food crops were freezing in the fields, evidence shows that the jet stream (the fast-moving river of air in the upper atmosphere) was misdirected. The jet stream usually meanders in an undulating path from west to east, but, after Tambora's outburst, it apparently shifted and ran almost north to south, steering arctic air directly down from the North Pole to New England and Europe.

Could the eruption of Mt. Tambora somehow have influenced the jet stream, in effect blowing it off course? "Give me all the weather and ocean temperature records from that time and I could probably tell you," Schneider joked. There's only a sparse weather record for the early 19th century.

Could El Chichón have played a similar role, displacing the jet stream this year? "Now that's a very interesting question," Schneider said—one where there is not yet enough evidence to provide an answer. But he believes the weather anomalies in the equatorial Pacific *are* clearly related to an abnormal jet stream path this year and noted that, in the Northern Hemisphere, where El Chichón's ejections have been most marked, the jet stream is still off course; the "Mexican Monsoon" is further west than usual, creating damp rather than dry weather in California.

Because of El Niño or El Chichón? "When you're dealing with multiple causes of a similar magnitude, it's all Ouija boards and voodoo dolls," he said. By throwing in wild cards like El Niño and El Chichón, nature is not playing the weather game by the usual rules this year. But Schneider is confident that ultimately these global-scale aberrations, which are still within the bounds of what Mother Nature apparently considers routine, will prove learning experiences, providing new pieces in the climate puzzle.

"1981 was the warmest year going," he said, attributing the gradual Earth-wide warming to humankind's influences. By pouring carbon dioxide into the atmosphere on an unprecedented scale, through burning fossil fuels, humanity is slowly but surely altering the climate. Increased atmospheric carbon dioxide, climate models show, acts like an invisible "security blanket." It traps heat which reaches the Earth in the lower atmosphere, preventing it from radiating away, much as glass in a greenhouse keeps heat in, and so is labeled "the greenhouse effect." Global temperature records show a steady, small increase which correlates with an increased carbon dioxide output from a ballooning, and more industrialized, world population.

"However, if 1982 is as warm as '81, then there's something wrong with our volcano theory. We've seen half a degree drop in temperature in the Northern Hemisphere so far, and that's consistent with the volcano theory."

nd the Body Human

that a brisk business has developed in "negative-ion generators" said to counter their effects.

Little in the vast catalog of sins ascribed to the weather has been proven outright or, for that matter, disproven. The problem is, "weather" takes in so many variables. Temperature, atmospheric pressure, wind speed, humidity, ions, and electromagnetic fields are only the most direct-acting ones. The variables may change slowly or suddenly. They may act singly or in concert.

The history of biometeorology is rife with examples of seemingly clear-cut phenomena turning out to be questionable at best: do full moons "cause" more rapes? Or is it simply that bright nights bring out more potential victims? Is the increased frequency of stroke in chillier weather "due" to the cold? Or to winter's respiratory infections, arduous snow shoveling, and sometimes depressive boredom—all of which may figure in a stroke's onset?

Still, researchers do know something about weather's effects on mind and body. For example, a body at rest in the shade, the motionless air at 91 degrees Fahrenheit and the humidity at 60 percent, is in perfect balance with its surroundings: it feels neither hot nor cold. More: An abrupt drop in ambient temperature brings with it an increase in blood clotting speed, urination volume, capillary resistance, muscle glycogen, and a variety of other, distinct physiologic responses, aimed at restoring the body's homeostatic harmony.

Then, too, some anecdotal evidence *does* get seemingly solid research support. For example, in a 1963 experiment, arthritis sufferers were placed in isolation chambers where "weather" could be precisely controlled. Researchers found that simultaneously dropping barometric pressure and raising relative humidity increased arthritic pain in most subjects. (It was the abrupt change, not the maintenance of particular values, that caused the worsening.)

And positive ions in the air *can*, as a matter of fact, bring on a complex of symptoms—migraine, nausea, irritability, and respiratory congestion—apparently by affecting the brain's levels of a neurotransmitter called serotonin. Negative ions, at particular concentrations, do indeed seem to counteract the positive ions' effect.

Still, for all the blame the weather takes, its impact can be viewed in the end as disappointingly slight. As one student of the subject, biometeorologist Michael A. Persinger, concluded in his book *The Weather Matrix and Human Behavior*, "The effects of weather change upon the human population are very insignificant. . . . Except for the blatant turbulent forms, such as tornados, most weather-related events evoke changes that are barely detectable above the trials and tribulations of daily life.

"Weather effects are well-immersed in the background noise of living."

—Robert Kanigel

That volcano theory, based on how airborne particles, bouncing back incoming solar radiation, affect atmospheric behavior, provides a basis for gauging the impact of large volcanic eruptions. Models can calculate the extent to which a dusting of high-altitude ash will decrease the amount of sunlight reaching Earth's surface and drop the overall temperature.

Temperature is only one parameter of global climate, Schneider added. "If the weather in Iowa City and New Delhi were to reverse, you'd still have the same average global temperature, but not the same weather," he said.

Average temperature is a handy indicator of global goings-on, interesting, but less than relevant to most people. (The old joke among meteorologists goes this way: a person with his head in an oven and his feet in a bucket of ice water shouldn't complain, because, on the average, he's got a comfortable temperature.)

And temperature is just a piece of the weather we're interested in where we live and work and play. Hot or cold, yes. But we want to know if it will be dry or wet. If the moisture will be rain or snow or fog. How long will it last?

What will the weather be? When we ask that, usually we're not concerned with half-degree changes in the world's temperature or erratic movements of the jet stream.

We're looking for an answer in the form of a short-term forecast, on what meteorologists call the mesoscale. *Meso* means middle and mesoscale meteorology is midway between global drought-patterns and the minute antics of cloud droplets within the roiling interior of a single thunderhead.

Mesoscale forecasts are for an area about the size of a metropolitan region, for times about the life of a storm system. They provide the basis for our decision making. Whether to go on a picnic. More serious concerns such as whether the day will be safe for sailing. Even life and death decisions: Should we evacuate Galveston because of Hurricane Alicia?

To enable us to make the right decisions, we depend on storm-sized information, projected a few hours or a day in advance. And it's here, on the mesoscale, that a combination of research efforts now coming to fruition and advances in weather-observing technology hold an exciting promise for better, more useful weather forecasting.

As George Benton explains it, three key pieces contribute to this potential:

- An accurate description of what's happening *now*. "The importance of this information is frequently underestimated," Benton said. Yet detailed information on what is happening at a particular location can, for example, indicate the approach of a strong storm front with heavy windshear. Knowing when a storm's possibly lethal conditions have almost reached an airport, for instance, means a runway—or even the terminal itself—can be quickly and briefly shut down to avoid having a violent downburst slam an incoming plane into the ground. The technology to provide such instantaneous weather details is available now.
- An extrapolation of present conditions into the near future: If a storm is moving northeast, how long will it continue in that direction? And at what rate? When will it reach a particular city, a lake, a canyon, or an airport?
- Intensification of a storm system: Is the squall line of storms going to grow more intense in the next hour, or weaken?

Projecting into the future and determining if a storm is intensifying are closely linked. A storm cell or system has a typical life cycle. Knowing if it's an infant growing and gathering strength or a tired oldster that has just about spent its fury will make forecasting much more accurate.

Yet identifying the exact stages of storm development and being able to spot storms which will not follow the "typical" pattern require more research and a better understanding of the physics of mesoscale weather, Benton said. Since the meteorologists' natural laboratory is the atmosphere itself, making observations on the weather requires working in the field, scrutinizing both the weather and the performance of new techniques for observing it.

Most of the new technologies were wheeled into place this summer for a field test of the weather service of the future—the Program for Regional Observing and Forecasting Services (PROFS).

Heading up the real-life test team was meteorologist Tom Schlatter. His group of researchers at the National Oceanic and Atmospheric Administration (NOAA) were given what he terms "one of the hardest problems in meteorology"—detailing and making short-term predictions of convective weather—storms which bring rain, tornados, hail, floods, and high winds.

It's a difficult problem because convective phenomena are brief and small. A typical storm lives from half an hour to an hour and may cover an area only about five miles across.

Living day-to-day, we rarely bother to predict small, short-term happenings. Most of us could confidently say when we're likely to be at home or work, or somewhere else, for the next few days. But you can't predict—hours or days in advance—when you may sneeze, get a headache, or have to scratch your foot.

Yet in terms of size and duration, these "personal forecasts" are comparable to predicting mesoscale storms for this country.

And like forecasting a sneeze, forecasting a storm becomes easier and more certain as you get closer in time to the event. You know, moments before it happens, when a sneeze is coming, maybe with enough warning to grab a handkerchief. You could, perhaps, make a better forecast if you could find out there's a cluster of tiny pollen particles approaching first your neighborhood, then your house, then the chair where you're sitting. And decide if you were going to wait for the pollen to reach your nose, or grab for the Kleenex, or leave the room and head upstairs.

On the scale of a storm, rather than pollen particles, that's the kind of information the future forecasts can bring.

"Instead of saying 'There's a 30-percent chance of thundershowers this afternoon in the Denver area,' we're able to say that there's a large cloud over Boulder [35 miles northwest of Denver] and it's moving slowly eastward, indicating it will give heavy rain in that area," Schlatter said.

"The technology is here to bring in this information and display it. But it takes a lot of ingenuity by meteorologists to make it work . . . and work well."

Tomorrow's forecasting center is in an evolutionary phase today, he explained; the PROFS system is a prototype of what it can be. The future weather service office will have precise, instantaneous computer displays far different from the color radar pictures TV weathercasters have made familiar.

"Detailed local and regional weather

NOAA uses this Doppler radar (in Boulder, Colorado) to measure winds. Its readouts are similar to the one above, which uses an arbitrarily assigned color mix ranging from cool to hot to emphasize a storm's areas of higher intensities and thus its severity. A similar display shows how fast the storm is moving toward or away from the antenna.

EL. 00.1
115KM
NRO
#4
16:35:02
0128S
NOAA

data in full, living color" is what the forecaster gets, Schlatter said, demonstrating the system. A touch on an indicator panel calls up weather information on every scale: A satellite picture of the entire U.S. A close-up of a state or region.

Another touch and the satellite picture zooms into a city-sized area of a few square miles, showing the distribution of clouds.

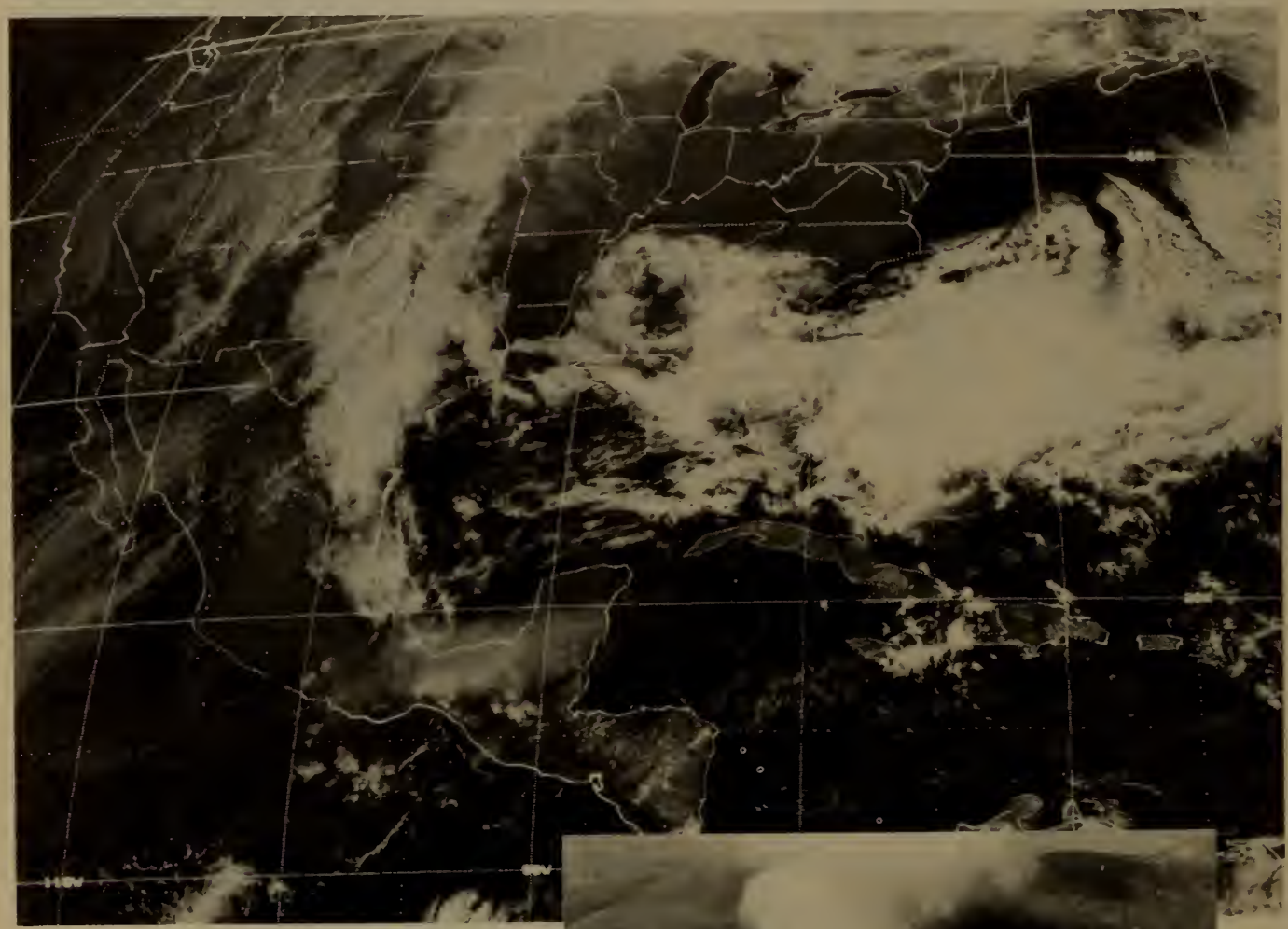
Another touch of the finger calls up a display of weather in the region. Radar pictures showing storms or air movements, with colors indicating the intensity of the storm and the direction it's moving. Wind patterns near the ground and aloft.

A menu of additional information can be summoned. Overlays showing county, city, or state boundaries can be added, or regional topography.

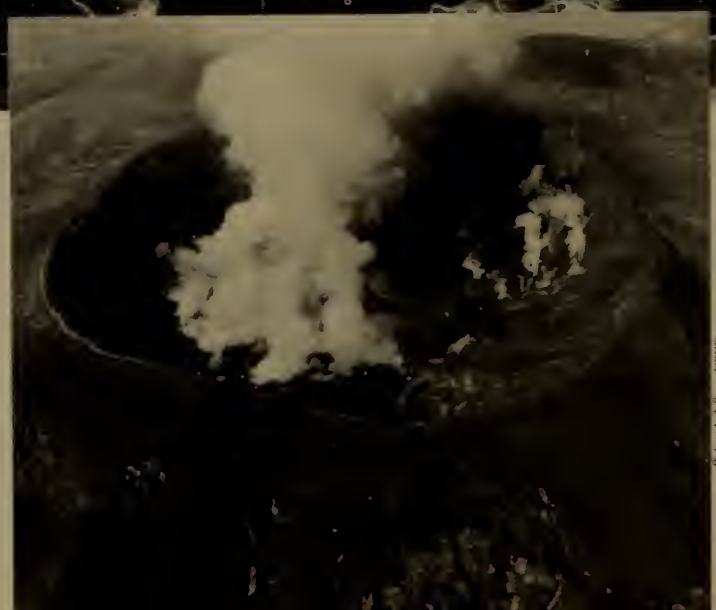
Underlying the graphic displays is a host of data from a dense network of observing devices: Doppler radar readings. Information from "profilers" which probe the atmosphere with microwave pulses to detail wind motions. Readings of temperature, dew point, solar radiation and wind, all piped-in from a grid of remote observing stations. Satellite data on clouds and their motions, winds, and temperature. Lightning detectors which locate electrical activity. More information from radiosonde balloons, conventional radar, even reports from airline pilots feed into the computers and are instantaneously transformed into displays on the screen.

How useful is this cornucopia of information? To find out, forecasters from every weather service region as well as researchers and forecasters from the private sector came to the PROFS facility this summer.

They were divided into groups which competed with each other in testing their forecasting skills. One used the coventional weather information systems, maps, and data. The other used only PROFS-provided information. "They were allowed to go out on the roof and look at the sky, though," Schlatter chuckled. "They insisted on it." (Spending a Colorado sum-



NOAA



Robert I. Tilling, USGS

Aerial view of El Chichón (right), taken June 2, 1982, shows the new crater formed in place of the original summit dome—blown off during the March–April 1982 eruptions. Located in Chiapas State in southeastern Mexico, El Chichón exploded on March 28 (a powerful follow-up came April 4). A satellite image taken March 29 shows a light haze over southeastern Mexico; by April 5, ash injected into the atmosphere from the eruptions had reached southern Texas. Layers of volcanic cloud were observed at altitudes of 12 to 16 miles.

mer in a darkened room, lit only by computer displays, was asking too much, even from those dedicated to improving their forecasting skills.)

Forecasters who have worked with the new system "have had a taste of honey. They want the system and they want it badly," Schlatter said. Impressed by the information and detail in the system, the visiting forecasters nevertheless criticized what PROFS does not yet offer. For example, one feature makes an instant film loop of four frames of cloud motion. Playing the loop forwards and backwards shows the immediate past motions of the storm and gives hints about its future behavior. A longer loop, incorporating more than four snapshots of a storm, would be even more useful, the forecasters said.

Most of the list of "wants" are improvements already under development, Schlatter said. But the forecasters' comments and criticisms will guide the refinement of the operational weather station of the future.

That system is designed to be adapted to each geographical locale where it will be used. In the Rocky Mountain region where PROFS is being tested, for example, knowing where a storm is situated along the canyons and drainages can be critical: A storm anchored above the Big Thompson Canyon produced the disastrous 1976 flood. The moisture-laden storm dropped 10 to 12 inches of rain into the narrow, impermeable mountain canyon in a matter of hours. The water had no soil to absorb it. Instead, it roared down the rocky, narrow canyon, sweeping away bridges, highways, homes, and tourist resorts, and claiming the lives of 139 people.

"With this new kind of weather information, I think we could handle a situation like the Big Thompson much better," Schlatter said. The system has yet to be tested for predicting fog, high winds, or dust storms. "Progress in these areas depends on the lifetime of the phenomenon."

"There are exciting trends in improving short-range forecasting," according to George Benton. No "scientific breakthroughs" are required. "It's a question of getting the equipment into place. Ten years is not an unreasonable time scale" for revamping the nation's weather systems, in his opinion.

"We need to work it out, but not in a monolithic way," Benton said. "The big problem is, research has steadily moved ahead while the operational aspects have been inadequately funded." Research is relatively inexpensive, he explained, while retooling the nation's weather ob-

Early Weather Instruments

Modern meteorological instruments go back only to post-Renaissance Italy. There, in the first decade of the 17th century, was invented the first crude progenitor of the thermometer—really just a long-necked flask inverted into a dish of water. An early anemometer, or wind-measuring device, came along a few years later, followed in 1664 by Evangelista Torricelli's barometer.

Credit for the barometer goes to Torricelli largely on the strength of his famous account of a crucial experiment: "We live submerged at the bottom of an ocean of elementary air." It seemed to him possible, he wrote, "to make an instrument which might show the changes of the air, now heavier and coarser, now lighter and more subtle." In the experiment, he filled a thin glass tube, sealed at one end, with liquid mercury, then inverted it in a flask of mercury open to the air. Opposed only by a vacuum, the mercury would rise in the tube to a height corresponding to the weight of the "ocean of air" above it.

Torricelli's apparatus was designed not so much to measure atmospheric pressure as to demonstrate the existence of a vacuum, a notion still much in dispute in those days. Later, the 18th and 19th centuries would refine meteorological instruments, creating mechanical contrivances of impressive ingenuity and sometimes considerable beauty. The 20th century would miniaturize such instruments through electronics, and feed their raw data into great number-crunching computers. But the earliest instruments were, like Torricelli's barometer, developed largely to explore basic physical concepts, not to help forecast the weather.

Many early scientific luminaries had a hand in designing meteorological instruments. Galileo, by all accounts, came up with an early thermometer. It was Descartes who first added a scale to Torricelli's barometer. Leibniz conceived a bellows-type barometer. The mathematician, architect, and all-around genius Sir Christopher Wren designed an instrument that not only measured weather but also recorded it. He called the device a "weather clock."

And even before Messrs. Fahrenheit and Celsius, Sir Isaac Newton came up with a thermometer. It used linseed oil as the thermometric liquid, assigned zero degrees to the freezing point of water, and took as its upper fixed point "blood heat"—the temperature of the human body—which Newton defined as 12 degrees. —RK

Long-range Weather

"Astronomers think of weather as the messy stuff you have to get above," says Michael Seeds. Seeds, an astronomer who also directs the Grundy Observatory at Franklin and Marshall College, takes the long-range view when it comes to the Earth's weather. "The last ice age started about three million years ago—and isn't over yet," he reminds you. "There's still ice on the polar caps. We're between glaciations now—but in another 20,000 years or so, the glaciers may return." Seeds says that astronomers and meteorologists are currently studying the relation between the ice age and secular variations in the Earth's orbit—minor oscillations about a stable mean that seem to have affected climate.

Although Seeds thinks "the orbital changes are going to dominate," he doesn't underestimate the effects of a warming trend: "Digging carbon compounds out of the Earth and burning them, nuclear fuel, solar-power stations in orbit—whatever the method—they're still pumping energy into Earth's atmosphere. When the electricity goes through your toaster, it's warming the atmosphere."

Closer to the present, Seeds notes, the Voyager flybys of Jupiter may provide some clues to Earth's current weather. "The explorations gave good information on Jupiter's weather patterns. Although Jupiter is much larger than Earth, it has no continents, no mountains, nothing to disturb weather patterns." Because "it's simpler," people building models to predict Jupiter's weather patterns are having much more success than with predictive models for Earth's weather. "If they can learn from Jupiter, eventually modelling Earth's weather may go better." —MRY

serving system runs smack into the political process of budget allocations.

Doppler radar, for example, provides more detailed, accurate information than the outmoded radars still being used by the National Weather Service. "Doppler has been used for years and years and years in research and was ready to move into operations a number of years ago. But the federal budget still doesn't call for full Doppler development until around 1993."

Benton foresees a new system which would accommodate the needs of each particular area. New York City, for instance, could have a network of weather stations connected to a central office providing information for industrial and private clients, the port authority, and airports, as well as the general public. Its instrumentation would, of course, differ from what a remote inland area would require.

Air safety as well as forecasting could be improved with the new weather monitoring systems. Regardless of safety concerns, he said, "the major budget decisions to upgrade equipment have been put off and put off."

The Federal Aviation Administration, the Department of Defense, and major industries are beginning to see the value of improved weather systems for their own needs. But, George Benton noted, no one should underestimate the public's interest in weather information.

Some of the indicators:

- About a billion calls are placed each year to taped telephone weather reports. At 10¢ a call, the public pays about $100 million annually for capsule weather information.
- The NOAA Weather Radio Network broadcasts continuous reports on a dedicated frequency. Special radios required to tune in, which run between $14 and $75 each, sell at a $100-million-a-year clip.
- Surveys show people consider the weather report the most important segment of television news. Producing TV weather reports costs about $500 million a year.
- The amount of weather information on radio is equivalent to four stations broadcasting continuously 24 hours a day. Its pricetag? About $1 billion annually.

The costs of simply distributing weather information is about $1.7 billion—more than eight times the budget of the National Weather Service itself.

Today's weather service is made up of about a hundred regional offices across the country. "If each had an observing radius of about 150 km [approximately 90 miles, the size of the PROFS network deployed in Colorado], there wouldn't be a whole lot of holes," Tom Schlatter said. Yet even Schlatter is not ready to move the system into immediate operation. Sophisticated new equipment needs to be evaluated, tested, and refined. Experience is required to devise the right monitoring systems to fill in the "holes" in a nationwide observing network. And, perhaps most importantly, forecasters themselves need training in using the new weather data displays.

"There are probably not a dozen meteorologists in the whole country who could tell you what *all* of this means," Schlatter said, motioning to the full display of weather readouts on the PROFS screen. Doppler radar also gives a different, less familiar pattern of radar information, which can mislead the untrained user.

Now on the drawing board is a National STORM Program. (In this case, STORM is an almost-acronym for *ST*ormscale *O*perational and *R*esearch *M*eteorology.) Its aim: to bring together research in the dynamics of the small-scale weather phenomena such as thunderstorms, flash floods, and freezing rain and then to test the new observing technologies against the rigors of reality.

The weather is not simply an easy conversational topic. In the average year—and so far 1983 has been far from average—weather creates about $20 billion in damages in the U.S. and claims more than 1000 lives.

The National Academy of Sciences-National Academy of Engineering recently tried forecasting important topics in meteorology for the next decade. It singled out mesoscale meteorology and climate studies as two of three areas of importance.

The third such area identified was "geochemical cycles," a lumpy, hydra-headed monster which includes acid rain and its effects, life cycles of heavy metals, and cycles of sulfur, nitrogen, and carbon. Humankind has been making massive changes in these natural cycles through industrialization, agricultural practices, and the widespread use of fossil fuels.

The dimensions of that story are equally global. And the question of how humanity's own activities are altering not only the weather and the climate but also the whole biological web of life is almost as hard to decipher as the game Nature is playing as she deals us the wild cards of El Niño and El Chichón.

Diane Johnson is a free-lance writer living in Boulder, Colorado.

Record Weather

For meteorologists, weather records are raw data, to be fitted into theories and predictions. Record weather, on the other hand, is interesting in itself: Just how hot did it get in El Azizia, Libya, on September 12, 1922?

On that day, the hottest day ever recorded, the temperature was 136°F (56°C). That outshines the hottest day on record in the U.S.: On July 10, 1913, Death Valley reached 134°F (57°C).

Which brings up the coldest temperature on record: -126.9°F (-88.3°C) in Vostok, Antarctica, on August 24, 1960. (Wind chill is not included, of course. The highest surface wind speed ever recorded was 231 mph, atop 6,288-ft. Mt. Washington, New Hampshire, on April 12, 1934.)

In 24 hours—March 15-16, 1952—73.62 inches (or 1,870 mm) of rain fell in Cilaos La Réunion in the Indian Ocean (compared to 43 inches in Alvin, Texas, July 25-26, 1979). In one month, 366.14 inches of rain fell in Cherrapunji in the Indian state of Assam—signalling the last month of a rainy season (August 1860-July 1861) in which 1,041.78 inches (26,461 mm) of rain were recorded. At the other end of the spectrum is Arica, Chile, where no rain fell from October 1903 through December 1917—171 months.

When it comes to snowfall, the U.S. firmly holds the record. In 24 hours, April 14-15, 1921, 75.8 inches of snow (193 cm) fell in Silver Lake, Colorado. A single storm dumped 189 inches (480 cm) on Mt. Shasta Ski Bowl, California, February 13-19, 1959. In January 1911, 390 inches (991 cm) fell on Tamarack, California, and the 1971-72 snow season brought 1,122 inches (2,850 cm) of snow to Paradise Ranger Station, Mt. Rainier, Washington.

And to end on weather's vicissitudes: the greatest change in temperature recorded in a day is 100°F (a drop from 44°F to -56°F) in Browning, Montana, January 23-24, 1916. The largest upswing in temperature—49°F in only two minutes—came on January 22, 1943, when the temperature in Spearfish, South Dakota, went from -4°F at 7:30 a.m. to 45°F at 7:32.

—MRY

WPI CLASS NOTES

WPI Alumni Association
President, Harry W. Tenney, '56
Senior Vice President, Donald E. Ross, '54
Vice President, Paul W. Bayliss, '60
Secretary-Treasurer, Stephen J. Hebert, '66
Past President, Peter H. Horstmann, '55

Executive Committee Members-at-Large
Henry P. Allessio, '61
Walter J. Bank, '46
William J. Firla, Jr., '60
John M. McHugh, '56

Fund Board
Edwin B. Coghlin, Jr., '56
Richard A. Davis, '53
Gerald T. Dyer, '56
Gerald Finkle, '57, Chair
Allen H. Levesque, '59, Vice Chair
C. John Lindegren, Jr., '39
Philip H. Puddington, '59
George P. Strom, '56

1924

Reunion **May 31–June 3, 1984**

1928

Laurette and **Gabriel Bedard** of Springfield, MA, celebrated their 50th wedding anniversary in April. Mrs. Bedard, who graduated from Westfield Normal School, was employed by the State Board of Education in Hartford, CT. Mr. Bedard was superintendent of Fire Alarm and Police Signals for the City of Springfield, retiring in 1966.

1929

Reunion **May 31–June 3, 1984**

1930

MARRIED: Kate Wagner and **Fred Peters** on June 11, 1983. Fred says he and Kate plan to attend the 55th reunion. (His first wife, Peg, died several years ago.)

The **Carl Backstroms** and the **Roscoe Bowerses** attended a regional meeting of the South West Florida WPI alumni group while in Florida last winter.

John Conley, who retired in 1967, currently resides in San Diego, CA. He keeps busy with the Lions Club as treasurer and as chairman of a committee on services to the blind. Besides tending his yard and playing a little golf, he attends adult education classes in a Continuing Education program affiliated with San Diego State.

Herb Davis reports from Florida that he was very ill last winter, but is now on the mend and hopes to visit his relatives in Massachusetts soon.

Norman Enman of Amherst, MA, retired in 1978 after managing the Lord Jeffrey Inn and University Motor Lodge for 30 years. Norman keeps busy with golf, gardening and town politics. He and his wife, Maryjane, enjoy trips to Florida.

Myrt Finney reports that his wife passed away last year. He is still living in Stroudsburg, PA, and keeps in touch with a few of his classmates.

George Marston writes that he hopes to make the 55th class reunion. He planned to take an Elderhostel course at the University of Minnesota in July. It's been 20 years since he retired from the University of Massachusetts at Amherst.

The **Jim McLoughlins** recently returned from a 50th wedding anniversary trip to St. Thomas. Jim continues on the board of directors of the Fort Nathan Hale Restoration Project. He also does volunteer work at the New Haven Colony Historical Society, writes articles about New Haven legends for the local newspaper and is researching his family tree.

Phil Seal has finished up his term as assessor for the Town of Gouldsboro, ME, and now intends to finish off the second floor of his house.

Pete Topelian continues with the quality control technology unit at Boeing in Renton, WA. He has five patents and has applied for his sixth, a patent on a bathroom cleanser that when applied gives fog-free mirrors and no-streak fixtures and tile. Pete says anyone wanting a free sample may contact him. (The Alumni Office has his address.)

John Wells reports that he has purchased a little computer. "I spend a lot of time practicing the art of programming, mainly just to find out if I can do it." He says he wishes he had one while he was at WPI.

Carl W. Backstrom, Class Secretary

1932

Emanuel Athanas has received an award for comprehensive and objective coverage of the congressional hearings on American military aid to Greece and Turkey as Washington correspondent of the Athenian newspaper *Mesimvrini*. He was slated to spend part of the summer on his native island of Rhodes.

1934

Reunion **May 31–June 3, 1984**

Charlie McElroy, 50th reunion committee chairman, reports that class reunion headquarters will be at the Sheraton-Lincoln Inn, 500 Lincoln St., Worcester. **Warren Davenport**, associate reunion chairman, and his wife, Helen, who successfully ran the hospitality suite during the 45th reunion, will again be in charge of hospitality for the 50th. Both the hospitality suite and the class dinner are slated for the Sheraton.

Charlie McElroy's address is: P.O. Box 455, Rye Beach, NH 03871. (Tel.: 603-964-8596.) Warren Davenport's address is: 53 Paine St., Worcester, MA 01605. (Tel.: 617-754-0293.)

Howard A. Whittum, Class Secretary

1935

Phillip Dean writes that during his long career with Northeast Utilities Service Company, one of his most challenging projects was converting a double-circuit 69KV and a double-circuit 27.6KV to a four-circuit 115KV line on a narrow right of way. This project, known as "Operation Shoehorn," resulted in a presentation to a meeting of the Edison Electric Institute and an article in *Electrical World*.

Ted Latour and his wife, Irene, live in retirement in Las Vegas, NV, where Ted pursues his hobby, politics, and has actively worked for several political candidates. He walks about five miles every day. In 1973 Ted retired from Du Pont following 38 years of service. The Latours have six sons and they have eleven grandchildren.

Irving Skeist, who worked as a research chemist for Celluloid Corp. (now Celanese Corp.) in Newark, NJ, for more than ten years, began his career as a consultant in 1955. He wrote an article on plasticizers for *Chemical Week* that caused the head of a cosmetics company to decide that he would be the right person to do some needed polymer research. With his backing, Skeist Laboratories, Inc. (consultants to the polymer industries), was born. The labs conduct marketing research for 300 companies in 20 countries. Irving has been the author/editor of five books. His *Handbook of Adhesives* is the best known reference work on that subject.

Harold Vickery, who has served as class agent, spent 36 years with Norton Company in Worcester and is now retired and living in Gloucester. A registered industrial engineer, he graduated from WPI's School of Industrial Management in 1954. Currently he is vice president of a small company that builds aluminum boats. The firm has built 40 so far, from 11 to 60 feet long. The Vickerys enjoy travel and photography.

Homer R. Morrison, Class Secretary

1936

Alexander Gordon participated in the 1983 International Congress of the Society of Automotive Engineers (SAE) in Detroit in March. He served as chairman and as co-organizer of a full-day symposium session on gaskets and presented a paper on gasket standards.

1937

The **Larry Grangers** have moved from the Cape to Covenant Village of Cromwell, CT. Their two-bedroom cottage is part of a continuing-care retirement community. During their years on the Cape, Larry and his wife, Natalie, served more than 1,000 hours each as hospital volunteers.

1938

In May, **Walter Knapp** retired as vice president of engineering from G.F. Wright Steel & Wire in Worcester. An SIM graduate, he has also served WPI as a class agent and as a member of the 40th class reunion committee. Long a leader in Phi Gamma Delta activities, he was awarded the fraternity's Durrance Award in 1976.

1939

Reunion **May 31–June 3, 1984**

Retired since 1981 from the Very Large National Radio Astronomy Observatory, **John Lancaster** and his wife, Phyllis, have been enjoying cruises in their 42-ft. ketch. They have summered in Maine and New England waters and travelled across the Bermuda Triangle to the Virgin Islands. Recently they sailed to South America.

1942

In April, **William Dodge** won a one-year term on the Board of Education in Montgomery, NJ. He is a chemical engineer with FMC, has a master's degree from the University of Louisville and is the father of two children.

Last February, **Herbert Goodman** bought the W.T. Grant building in Worcester and is developing it as the Executive Plaza, an office condominium complex. For many years he headed Herbert Engineering, Inc., which pioneered "tilt-up" construction (building concrete panels on the ground, then tipping them up between reinforcing girders) as well as guaranteed cost-control systems in the Worcester area. Now semi-retired, he says he takes care of his grandchildren sometimes and flies his four-passenger airplane.

B. Leighton Wellman: From Books to Blueprints

His revised 1957 textbook, *Technical Descriptive Geometry,* is still in print, and he still enjoys the spacious ranch house he designed in 1958. Professor Emeritus B. Leighton Wellman, '35 MSME, has the knack of doing a project right the first time.

He graduated with honors from the University of Illinois in 1930. That same year he joined the WPI mechanical engineering staff as an instructor. He was promoted to assistant professor and head of WPI's Engineering Drawing Division in 1938. As division head, he helped develop and improve courses in drawing, design and descriptive geometry.

Wellman's special interest in descriptive geometry prompted him to write the first edition of *Technical Descriptive Geometry* in 1948. "The book offered a new approach to a classical subject and it found wide acceptance in engineering colleges around the world," he says. In 1964 it was translated into Spanish. Nine years in the making, his *Introduction to Graphical Analysis and Design* was published by McGraw-Hill in 1966.

During World War II, Prof. Wellman directed WPI's Engineering, Science and Management War Training Program. He was secretary of the faculty from 1955 to 1968 and the John Woodman Higgins professor of mechanical engineering in 1967–68.

In 1963, he was named chairman of the Engineering Graphics Division of the American Society for Engineering Education. (The division later awarded him a distinguished service citation.) He has been listed in *Who's Who in Engineering.* In 1964, he was awarded an honorary doctorate from WPI.

The Wellmans at home.

Today, Prof. Wellman and his wife, Marjorie, are living in retirement in Worcester. In his basement shop he pursues a lifelong hobby, printing. Since retiring in 1968, the Wellmans have taken nine tours, including trips to Europe, the Orient, Canada and Alaska. They enjoy "Christmas in July" family reunions with their son, Warren, and daughter, Elaine.

This year, Prof. Wellman is especially looking forward to the get-together. "Warren has promised to take me riding in his new hot rod," he says. "It's a '64 Chevy convertible with a fiberglass body he designed and built himself," he reports with parental pride. Designing and carrying out projects appear to be Wellman family traits.

Richard Vaughn has retired as manager of tool engineering for Pratt & Whitney Aircraft's Southington, CT, plant after 34 years of service. Also, he has retired as an LCDR in the Naval Air Corps. Currently, he resides in Glastonbury, CT, and Mashpee, MA.

1944

Reunion **May 31–June 3, 1984**

1946

Judge **Ernest Hayeck** of the Worcester Central District Court was elected chairman of the American Bar Association National Conference of Special Court Judges during the 1983 ABA annual meeting held in August in Atlanta. Judge Hayeck has served on the Massachusetts bench since 1970, and is currently chairman of the Advisory Committee of the Jury Management System project designed to bring "one day-one trial" jury service to the entire state. Under that system, no citizen can be required to serve as a juror for more than one day, or more than one trial. Recently he was elected to the board of trustees of Worcester's Mechanics Hall.

Howard Mayo has been named engineer of the year by the Lincoln chapter of the Pennsylvania Society of Professional Engineers.

1949

Reunion **May 31–June 3, 1984**

Joe Skidmore has retired from Armco, Inc. He had open-heart surgery in February.

1954

Reunion **May 31–June 3, 1984**

Richard Meirowitz is now a senior engineer with Singer Corp., Kearfott Division, in Wayne, NJ.

Roger Wildt has been named director of the new construction marketing division for Bethlehem Steel's steel group in Bethlehem, PA. Earlier this year he was promoted to assistant manager of sales engineering. He is a registered professional engineer.

1955

Robert Schultz, professor of civil engineering at Oregon State University, Corvallis, has been reappointed to the Oregon Board of Engineering Examiners. He is a past president of the Corvallis Optimist Club and a member of the ASCE, the American Congress of Surveying and Mapping and the Professional Land Surveyors of Oregon. Also, he is a member of the Engineering Accreditation Committee of the Accrediting Board for Engineering and Technology, which sets standards for and evaluates engineering schools nationwide.

Robert Stempel, general manager of Chevrolet, was profiled in the May issue of *Road and Track* magazine. He is a WPI trustee.

1956

Arnold Hall is president of Scacure, Inc., marine brokers-engineers, in Westerly, RI. An executive search specialist, Hall serves as a consultant and negotiator in the hiring process between employer and prospective employee.

Charlie Healy has been named managing director of Ranhill Ebasco in North Sydney, Australia.

1957

Dr. **John Buzzi,** president of Kupper Associates of Piscataway, NJ, has been honored as "Construction Man of the Year" by the New Jersey Ready-Mixed Concrete Association and the New Jersey chapter of the American Concrete Institute. (Kupper is one of the largest independently-owned civil engineering firms in the state.) Buzzi also serves as president of the Water Resources Association of the Delaware River Basin and is chairman of the U.S. Army Corps of Engineers New York District Public Involvement Coordination Group.

Anthony Matulaitis was recently appointed manager of manufacturing engineering at Rathbone Corporation in Palmer, MA. He directs the firm's metallurgical and engineering program for cold-drawn shaped products used in the computer, business machine, firearms and gas turbine industries. He holds a BS and an MS from WPI.

1959

Reunion **May 31–June 3, 1984**

Currently **Fred Lutze** is professor of aerospace engineering at Virginia Polytechnic Institute and State University in Blacksburg. For the past two years he has been a licensed private pilot.

1960

Irwin Jacobs has been named president of Frey Associates, Inc. Previously he was senior vice president of Data Terminal Systems, Maynard, MA, and a 17-year employee of Digital Equipment Corp., which he served as product group manager and vice president.

Arthur LoVetere, president of MacDermid, Inc., has been named associate chairman of the annual interfaith National Bible Week slated for November in Waterbury, CT. A past chairman of the local Chamber of Commerce, he is director of the Colonial Bank and a former president of the Metal Finishing Suppliers' Association.

1961

Still with GE, **John Donnelly** is currently on a three-year assignment as managing director of specialty materials in Ireland. He is located in Dublin, where construction and start-up of a facility to produce synthetic diamonds for a worldwide market are being finalized.

Normand Noel has been appointed senior manager of business development for Gilbane Building Company's Northeast regional office in Providence, RI. He has more than 20 years of experience in the construction and consulting business, including employment with Shell Oil and Tampa (FL) Electric Co. Currently Noel is a lieutenant colonel in the Marine Corps Reserve. He has an MBA from the University of Connecticut.

Kenneth Virkus writes: "Another successful year with the Alumni Admissions Program." He has another year to go as a member of the New Jersey Governor's Ethnic Advisory Council. Recently he was promoted to research section manager at General Cable Co., Edison, NJ.

1962

Brian O'Connell was promoted to captain in the U.S. Navy on St. Patrick's Day, with ceremonies held later at Naval Facilities Engineering Command Headquarters (NAVFAC) in Alexandria, VA. Currently he is the assistant commander for family housing for NAVFAC. During his career he has served in Vietnam, Guam, and at the Navy's newest Trident submarine base at Kings Bay, GA. Among his decorations are the Meritorious Unit Commendation, Navy Achievement Medal and Vietnam Service with Silver Star. He graduated from Stanford University with an MSCE and from the Naval War College.

1963

Paul Abajian continues as associate professor of science at Johnson State College in Vermont. In his spare time, he is active with Vermont aviation.

Gary Adams spends his summers doing research at Mystic (CT) Aquarium. He is an associate professor and chairman of the math department at Thames Valley State Technical College in Norwich.

Currently, **Walter Arell** serves as a senior programmer and manager of microcode development at IBM Corp., Kingston, NY. He has been a member of the Stratton Mt., VT, ski patrol for 15 years, and his daughter, Shannon, 11, is a promising ski racer at Stratton. Daughter Sydney is 6.

Dr. **Alfred Barrett** is section head of power systems for General Motors in Goleta, CA. He enjoys photography, classical music and carpentry.

1964

Reunion **May 31–June 3, 1984**

John Lindquist has been named group manager for textile development by the B F Goodrich Tire Group. He joined the firm in 1964 as a

materials engineer. During his Goodrich career he has been a senior product engineer for tire compound development, a section leader in aircraft tire development and manager of passenger tire compound development. A member of the Rubber Division of the American Chemical Society, Lindquist is also a life member of the Akron Rubber Group.

1965

Phil Ryan was recently elected a director of Public Service Co. of New Hampshire in Manchester. He is a senior partner in Bigelow Co., a management consulting firm.

"Hutch" Wyman is now quality cost reduction manager for the Torrington Company. He is married, has two children and is busy with church and Kiwanis work.

1966

A town meeting member for five years and past president of Precinct Five, **William Collentro** has joined the finance committee in Falmouth, MA. He is employed by Vaponics Co., Plymouth, a firm that designs and manufactures water purification equipment.

Richard Somers II serves as director of Different Drummer, Building Associates, in Wellesley, MA.

1967

MARRIED: Peter Shanley and Ellen Rosa on July 23, 1983, in New Haven, CT. Ellen holds a BS in nutrition and food science from Syracuse University and interned at Massachusetts General Hospital in Boston. She has an MBA from Babson College, and he has an MBA from RPI.

Currently, **Frank Manter,** PE, is with the Neat Consulting Co., West Acton, MA. The firm is concerned with electrical design, controls systems and process controls.

Noel Potter of General Motors Research Laboratories was author of a technical paper, "Determination of p-Phenylenediamine Antiozonant in Neoprene Rubber," which was presented at the 123rd Rubber Division meeting of the American Chemical Society in Toronto, Canada, in June.

William Tanzer, a production supervisor at Eastman Gelatin in Peabody, MA, has been named to the Board of Health in Hamilton, MA.

1968

Piyush Amin, PE, has been promoted to engineering manager of the structures section at Michael Baker Corporation, Beaver, PA. Currently he is project manager for the design of two bridges in West Virginia. He holds three master's degrees, including a recent MBA from Penn State.

In April, **Bob Demers** was appointed chief respiratory therapist at Stanford University Hospital in California. He is a clinical resource person to a department of 90. Previously, he was intensive care specialist at the UMass Medical Center in Worcester.

Bob Ellis is a trucker for the Veltman Terminal Co. in Los Angeles.

In May, **Eugene Murphy** was named product marketing manager at Power General Corp., Canton, MA.

1969

Reunion **October 1, 1984**

Michael Delleo, Jr., an assistant professor at the U.S. Military Academy, West Point, NY, was recently promoted to the rank of lieutenant colonel in the U.S. Army.

Last spring **"Rick" Follett** and his family moved from Massachusetts to California, where Rick continues as a senior field applications engineer with Advanced Micro Devices (AMD) near the "Silicon Valley." He has been with AMD for four years.

Air Products and Chemicals of Allentown, PA, has appointed **Arthur Katsaros** director of business development for the company's Chemicals Group. He will oversee group market research, economic evaluation and strategic planning. With the firm since 1973, Katsaros was previously business manager of nitration products. He has an MBA from Lehigh.

Edward Mierzejewski is now manager of transportation services for the consulting engineering firm of Post, Buckley, Schuh & Jernigan, Inc., Tallahassee, FL. He has an MSCE from MIT.

Mahendra Patel has been elected president of the Engineering Societies of New England, Inc. He is a senior mechanical engineer in the engineering, planning and research department of Boston Edison Company and is a mechanical group leader in the firm's mechanical and structural design division. A member of the ASME, he now heads the Boston chapter's honors and awards committee for the New England region.

B. Lee Tuttle, an assistant professor of process engineering at GMI Engineering and Management Institute in Flint, MI, recently received the Ralph R. Teetor Award from the Society of Automotive Engineers and the Dow Award from the American Society for Engineering Education. The Teetor Award cites excellence in undergraduate teaching in automotive-related fields, while the Dow Award recognizes enthusiasm in engineering instruction.

1970

MARRIED: Dr. **Lothar Kleiner** to Donna Hiznay on July 2, 1983, in Plainesville, OH. She has a degree in chemistry from the University of Notre Dame, Euclid, OH. A senior research engineer with Raychem, Menlo Park, CA, he has an MS from the University of Delaware and a PhD from the Polymer Science Institute at UMass.

David Emery, a former U.S. representative from Maine, has been confirmed by the U.S. Senate as deputy director of the Arms Control and Disarmament Agency in Washington, DC. He previously had served as a consultant for the agency.

Dr. **James Hannoosh** was recently named director of new business development for advanced ceramic components in Norton Company's high performance ceramics business unit. He has a master's degree and doctorate from MIT.

John Keenan has been promoted to operations supervisor at Unit 2 of Northeast Utilities's (NU) Millstone Nuclear Power Station in Connecticut. He joined the Connecticut Light and Power Company, an NU subsidiary, in 1970 in Waterbury. He was advanced to engineer at Millstone 2 in 1975. In 1979, he was named senior engineer and in 1981, maintenance supervisor.

James Troupes, chief project coordinator of Allen & Demurjian, Inc., Boston, has been named a vice president and director of the consulting firm. Recently he received his registration as a land surveyor from the Massachusetts Board of Registration of Professional Engineers and Land Surveyors. He has been responsible for many multi-screen cinema complexes from Maine to California, as well as real estate acquisition projects for the U.S. Army Corps of Engineers. Prior to joining Allen & Demurjian in 1977, Troupes served as chief of survey with Moore Survey & Mapping Corp., Shrewsbury, MA, and as technical consultant to the Town of Milford.

1971

MARRIED: Robert Dugger, Jr., and Janice Ramondetta in Newington, CT, on June 18, 1983. Janice received two degrees from the University of Connecticut and is with St. Francis Hospital and Medical Center. Robert, who holds a master's degree from the University of Hartford, works for Barclays American/Business Credit in East Hartford.

BORN: to Patricia and **Bob Trachimowicz** a third son, Nathan Patrick, on March 26, 1983. Timothy is 6 and Matthew, 4. Bob is resident engineer with Ebasco Services, Inc., in Houston, TX.

Arthur Jackman, head of the math department at the Keefe School in Framingham, MA, was recently named "Teacher of the Year" for the secondary-school level by the State Department of Education. Currently he is setting up a microcomputer lab at Keefe and teaching computer science part time at Dean Junior College. He has a master's degree in math from the University of Lowell.

John Meschisen has been appointed director of purchasing and materials control at EUA Service Corp., Lincoln, RI. Previously he was manager of division engineering. He belongs to the IEEE and serves as chairman of the underground systems subcommittee of the Electric Council of New England.

Kevin O'Connell recently left Arkwright-Boston Insurance and is now director of loss prevention for W.R. Grace & Co. in Manhattan.

Bill Philbrook is currently with Scott Systems, Inc., Marlboro, MA.

U.S. Army Maj. **Richard San Antonio** has completed his fellowship in cardiology at Brooke Army Medical Center in Texas. With the Army for seven years, Richard has now

been assigned to the Walter Reed Army Medical Center, Washington, DC. He holds an MS from MIT and a medical degree from Washington University. His wife, Maj. Pamela San Antonio, is a pediatrician.

Since May, **Ron Zarrella** has been serving as managing director of Playtex (Pty.) Ltd. in Australia. He resides in Mosman.

1972

Sam Cuscovitch recently left CIGNA Corp. to form Sage Telecommunications, Inc., a Connecticut-based firm providing professional services and software products for telecommunication vendors and users. He lives in Coventry, CT.

Patrick Lafayette has been named water pollution control director in Stonington, CT, and will direct a local $3-million sewer expansion project. Formerly, he was city engineer in Norwich. He holds a master's in wastewater treatment from the University of Maine.

Mark Samek, a registered professional engineer, has been promoted to senior engineer at Northeast Utilities, Hartford, CT. After joining the firm in 1978, he was advanced to associate engineer in 1979 and to engineer in 1980. He has a MS in nuclear engineering from MIT.

Dr. **August Sapega,** professor of engineering at Trinity College, Hartford, CT, has been named to the college's Hallden professorship. With the faculty since 1951, he has been coordinator of computing activities since 1977 and was chairman of the engineering department from 1970 to 1981. He holds BS and MS degrees from Columbia and a doctorate in electrical engineering from WPI. His major fields of research are solid state electronics and the applications of mini- and micro-computers to engineering problems. He is the author of publications in both of these areas. From 1979 to 1983 he was chairman of the New England Regional Computing Program.

1973

BORN: to Kristine and **William Nutter** a son, William Douglas, on May 10, 1983. Kristine graduated from the University of Wisconsin and has a master's degree from Florida Institute of Technology. Both Nutters are employed by Rockwell International.

After a six-month stay in Zurich, Switzerland, **Ron Bohlin** was slated to return to Northboro, MA, in August.

William Cormier, Jr., has been named as supervisor for zeolite and fluid cracking catalyst preparation by Katalistiks, Inc., Baltimore, MD. Previously he spent nine years with Mobil Research and Development Corp., Paulsboro, NJ, where he was a senior research engineer. He has coauthored four patents on zeolite synthesis and fluid cracking catalysts and is named on four other pending patents.

Paul Parulis has been promoted to senior engineer at Northeast Utilities's Millstone Nuclear Power Station. A registered professional engineer, he had been a commissioner for the town of Waterford's Water Pollution Control Authority.

Lt. **Robert Steinberg,** USN, was awarded a master's in naval architecture and marine engineering and a professional degree of ocean engineer from MIT in May. He has served with the Navy for 11 years, and is slated to be stationed in Boston.

L to R: Paul Glazier, Headen Thompson, Carl Benson, and Roger Iffland

WPI Grads Follow Good Neighbor Policy

It may be officially listed as "East Hill Rd." in the Torrington (CT) street directory, but "Alumni Hill" would not be a misnomer. Since the 1940s, four WPI alumni have been East Hill neighbors.

"Not only that," says Carl Benson, '36 ME, "we all spent our entire careers with the Torrington Co. and are all now retired." Still carrying on their long-standing good neighbor policy with Benson are Paul Glazier, '37 ME, Headen Thompson, '36 EE, and Roger Iffland, '39 ME. Another Torrington friend, Harry Haag, is also one of the original "settlers."

"After World War II, when building materials again became available, we got together and decided to buy land and build," Benson continues. "Roger knew of some farmland on the east side of town where he had helped cut hay as a boy. We had the property surveyed and laid out in seven one-acre lots."

Today, the neighbors continue to enjoy each other's company and working on personal projects. Iffland helps out friends and family with wiring and building problems and likes playing cards. He also gardens and takes long walks. In 1980 he retired as chief of mechanical engineering after 40 years with the company. He and his wife, Lucy, have five children, ten grandchildren and two step-grandchildren.

Paul Glazier and his wife, Marjorie, who have two children and one grandchild, collect antiques and do some selling at shows. They belong to the Pewter Collectors Club of America and attend club meetings at various locations where collections are on exhibit.

Thompson, a retired chief plant engineer, belongs to SCORE (Service Corps of Retired Executives) and is past president of the local Rotary Club. He enjoys amateur radio, travel and photography. The Thompsons have a daughter and a grandson.

Carl Benson retired as director of research at Torrington. His hobbies include woodworking, making violins and golf. Soon he and Doris, who have two daughters and three grandchildren, expect to move into a remodeled cottage in Charlestown, RI. They will be the first original residents to move from East Hill Rd.

1974

Reunion **October 1, 1984**

MARRIED: Edward Arsnow and Barbara Griffin in Melrose, MA, recently. Barbara graduated from Bates College and Boston University. Both Arsnows are product planners at Western Electric. Edward is also studying for his MBA at Northeastern....**Stephen Powlishen** and Lori Cowan on May 28, 1983, in Wallingford, CT. Lori graduated from Southern Connecticut State College and works for Hewlett Packard, where Stephen is also employed....**Warren Spence** and Emily Short on January 31, 1983....**Anthony Tomasiello, Jr.,** and Janet Amorello on June 25, 1983, in Worcester. Janet is a self-employed graphic designer. Tomasiello, who graduated from Suffolk Law School, is an attorney with the law firm of Healy & Rocheleau, P.C....**Peter Walworth** to Elizabeth Cardin in Attleboro, MA, on May 29, 1983. A sales administrator for Apollo Computer, Inc., in Chelmsford, she graduated from Lasell Junior College. Peter is employed by Applicon in Burlington.

In May, **Robert Barry** received his MSEE from UVM in Burlington, after attending the university full time through IBM's LSI Institute Program. He is a staff engineer for IBM in Hopewell Junction, NY, where he works in integrated circuit design.

Bruce Beaupre has joined the sales staff of Howard Katz Real Estate Associates in Worcester. He is a candidate for a master's degree at WPI.

Capt. **Christopher Cigal** has returned from Germany and now lives in Forest Hill, MD.

Actor-magician **Steve Dacri** has opened the Steve Dacri School of Magic in North Hollywood, CA.

Mathew DiPilato was recently promoted to manager of the Manchester (NH) office of Goldberg-Zoino & Associates, Inc., a geotechnical consulting firm.

Jim True holds the post of programmer-analyst at Sanders Associates in Nashua, NH. He is serving his second term as treasurer of the Nashua Theater Guild.

Andrew Wemple has been promoted to associate actuary within the group actuarial organization at State Mutual in Worcester. Promoted to assistant actuary in 1980, in 1979 he was named a fellow of the Society of Actuaries.

Mark Whitney, who has a professional engineer's (PE) license in Connecticut, recently received his PE license in Massachusetts.

Ed Wiles is now chief engineer and assistant sales manager for Concrete Structures, Inc., a pre-cast, pre-stressed concrete manufacturer headquartered in Richmond, VA. Last spring he received his MBA from the University of Richmond. Married, Ed is the father of Christina, 2.

Jim Rubino, Class Secretary

1975

MARRIED: Dr. **Torbjoern ("Toby") Nygaard** and Dr. Lisa Mellman in Denver, CO, last October. Dr. Mellman, who retains her maiden name, is a resident in psychiatry at Columbia Presbyterian Hospital in New York City. Toby recently completed his residency in internal medicine and has now begun a residency in neurology at the College of Medicine and Dentistry of New Jersey in Newark.

BORN: to Melody and **Chris Danker** their second son, Jared Fitzgerald, on April 26, 1983. Chris is a senior manufacturing engineer for Electronized Chemicals Co., Burlington, MA. Currently, he is in charge of all processes at the firm's new Wilmington facility....to Joanna and **Martin Fugardi** their first child, Daniel Martin, last Memorial Day. For the past year Martin has been project engineer and chief inspector on a $150-million project for the government of Qatar. After traveling to Cyprus and Paris, the Fugardis planned to return to the U.S. in time for Homecoming....to Mr. and Mrs. **Richard Mariano** their first child, Diane Elizabeth, on September 27, 1982. Mariano is an operational planner for the Personal Care Division at Gillette....to Soheila and **Kazem Sohraby** a daughter, Mariam, on April 10, 1983. Currently, Dr. Sohraby is manager of the communications network, planning department, at Computer Sciences Corp., systems division.

Art Aikin, who has served as a WPI class agent, is a materials engineer at the Naval Air Engineering Center (NAEC) in Lakehurst, NJ. He is a member of the Sea 'N Air Toastmasters' Club for NAEC Lakehurst, and is active in the Toastmasters Youth Leadership programs. Currently he is studying for his MS in engineering management at Widener University, Chester, PA.

Bob Ankstitus, a project manager with the EPA, is concerned with emergency cleanup activities for oil spills, hazardous materials spills and hazardous waste site cleanups in New England. He and his wife Patti have three sons. Hobbies include sport-fishing and camping.

Rob Apkarian has been promoted to senior electron microscopist at the University of Louisville in Kentucky, where he built an EM lab modelled on those he had worked in previously at the Yale University School of Medicine. Since graduation from WPI, he has served as an electron microscope technician for Dr. Danielli in WPI's Life Sciences Department and for Yale Nobelist Dr. George Palade. After studying at the University of Illinois Medical Center in Chicago, he transferred to Clark and completed his MS in biology. He has presented 10 articles at international EM conferences and soon plans to host his first EM conference on high-resolution scanning electron microscopy.

Bob ("Snake") Bradley continues with DEC in Marlboro, MA, where he is product manager for communications hardware and software products for one of DEC's personal computers. He has travelled to Europe and Asia on business, as well as to the "Silicon Valley" in California, "where the micro industry thrives." He is currently completing his MS thesis in computer science at WPI.

After a five-year absence, **Bill Cunningham** has returned to Riley Stoker Corp., Worcester, where he is a staff I&C engineer. Bill is a member of the Webster Public Safety Committee and the U.S. Coast Guard Auxiliary.

Nicholas Kyriakos is with the Societe Nationale Elf Aquitaine (production), the French nationalized petrochemical company in Pau. As project engineer, he is responsible for the offshore and onshore oil and gas projects. Earlier he worked on projects in South America and Africa.

In June, Dr. **Joe LeBritton** joined Burr-Brown Research Corp., Tuscon, AZ, where he is a software engineer. For the past two years, he was a high-energy physicist for the University of Arizona, Tucson, conducting experiments at the National Accelerator Laboratory in Batavia, IL.

On Valentine's Day the **Richard Nortons** received a hoped-for valentine, their adopted daughter, Samantha Julie. They are active in the local chapter of the Open Door Society, an adoptive parents support group. Richard is a project manager at Gale Engineering Company, Inc., Braintree, MA.

Beth Pennington is living in Greenwood, SC, where she is doing independent consulting on computer system installations and use. Besides attending the executive MBA program at Emory University in Atlanta, GA, she also serves as chairman of the computer science ad-

Behn Writes Guide To Decision Making

"Analytical thinking is the key to making intelligent choices," says Robert Behn, '63, coauthor of *Quick Analysis for Busy Decision Makers*, published recently by Basic Books, Inc. "Anybody can make better decisions, even when time and information are limited," Behn continues, "and by using the quick analysis system, the decision-maker can help stack a few more odds in his favor."

The new director of Duke University's Institute of Policy Science and Public Affairs, Behn wrote the 415-page *Quick Analysis* with Duke colleague James Vaupel. The book illustrates the power of quick analysis in a variety of decisions—such as:

1. Should an angina patient risk open-heart surgery?
2. Should a business executive introduce a new product?
3. Should the President launch a nationwide flu vaccination program?
4. Should a corporation stop construction of a new plant in a war-torn country?
5. Should the plaintiff in a civil suit accept an out-of-court settlement?

In such situations, Behn says different people will make different but equally intelligent choices in accordance with their individual beliefs and preferences. "The trick," he explains, "is to use a simple 'decision tree,'" resembling on paper the familiar family tree diagram. "A decision tree helps you concentrate your analytical energies on the key components of your dilemma," he continues.

Decision-maker at work.

Most books like Behn's require the reader to have an advanced degree in applied mathematics before opening the cover, but with the aid of *Quick Analysis* you can do a lot of the calculations on the back of an envelope, he reports. "At the most, you need only a pocket calculator."

The book's simplified approach to decision making is getting considerable attention at the university level, the Duke researcher says, but its concepts are useful in business and private life as well.

visory board at the local community college, as a board member of the new Women's Center and as a member of the United Way budget committee.

Penn Pixley continues as plant engineer for Celotex Corporation in Quincy, IL. He has his own TRS-80 Model III computer and serves as an officer with the Great River Microcomputer Users Group of Quincy. The Pixleys' first child, Brian, was born last December.

Steve Sweeney is the supervisory industrial engineer at the naval plant representative office for GE's Ordnance Systems in Pittsfield, MA. He has an MBA from the University of Hartford and attends the Union College Extension program in Pittsfield, working for his master's in computer science.

Todd Whitaker is now working on one of the Navy's first projects in fiber optics at the Naval Underwater Systems Center in New London, CT. Previously, his job has taken him to NATO-related work in France and England. Besides pursuing his MSME at UConn, he is looking forward to building a post and beam, passive solar Cape Cod home.

Mark Youngstrom, PE, is a project engineer at Wright Engineering Ltd., Rutland, VT. Currently he is concerned with municipal water supply, wastewater treatment and hydroelectric projects. Active with the Rotary, he also serves on the board of trustees of the Vermont Institute of Natural Science and is president of the Rutland County Audubon Society.

Patricia Graham Flaherty, Class President

1976

MARRIED: William MacIndoe and Gail Matteson on April 30, 1983, in Coventry, RI. She graduated from Community College of Rhode Island and URI and is employed at Kent County Hospital. He works for Federal Products....**Robert Roy IV** and Diana Slater in Edgartown, MA, on June 19, 1983. Diana, a member of the faculty at Meadowbrook School in Weston, graduated from Wellesley and received her MA from Lesley College. Robert is a systems engineer at GTE/Sylvania in Needham, MA.

Bill Clark is now a senior manufacturing engineer with NEC Information Systems, Inc., in Woburn, MA, a wholly-owned subsidiary of NEC Corp. of Japan. The Woburn division manufactures the APC personal computer, small business systems and peripherals such as printers and disk drives. In November the company is slated to move to Boxboro, MA.

Kenneth Duda was recently awarded the Doctor of Optometry (OD) degree from the New England College of Optometry in Boston.

Peter Hallock is a senior programmer-analyst for the customer service management informations systems group at Prime Computer in Natick, MA.

Mark Johnson has been promoted to the newly created post of director of engineering for Bridgeport (CT) Hydraulic Co. (BHC). He is responsible for managing BHC's engineering and planning programs. A registered professional engineer, he has a master's in environmental engineering from the University of Maine.

Barry Siff, director of industrial relations for Colonial Provision Company in Boston, is an active member of the Industrial Relations Research Association. This fall he is studying in the evening division at Suffolk University Law School. Barry, his wife, Judy, and four-year-old son, Brian, all enjoy running.

Yinmin Yang has completed all of the requirements for his PhD at Carnegie-Mellon University in Pittsburgh. His dissertation dealt with "Thermal and Elastohydrodynamic Analysis of Reciprocating Rod Seals in the Stirling Engine." He has an MS from WPI.

1977

MARRIED: Robert Horton and JoAnn Rinaldi recently in Mechanicville, NY. A registered nurse and graduate of the Samaritan Hospital School of Nursing, Troy, JoAnn is with the pediatric department at Samaritan Hospital. Robert is a production engineer for the GE Silicone Products Division in Waterford.... **James Lunney** to Norma Green in Scotland on April 9, 1983. She was educated in Glasgow. Lunney has been a technical representative for GE at the Navy Submarine Base in Holylock, Scotland, for the past three years.... **Christopher Owen** and Dr. Mary Helen Wesolowski in Hopedale, MA. A research associate at the Worcester Foundation for Experimental Biology, she received her BA from Regis College and her PhD from Clark. Owen did graduate work at Clark and is currently a research assistant at Massachusetts General Hospital....**George Whitwell** and Mary Barta on June 11, 1983. Mary has a DVM from Cornell. George received his PhD in chemistry from Cornell last year. He is an associate research chemist for Stauffer Chemicals Co.

BORN: to **Brian** and **Kristina Perry Buckley** a daughter, Sarah Tait, on July 11, 1983. Brian is a nuclear engineer at Portsmouth Naval Shipyard in Kittery, ME. The baby's maternal grandfather is **Roger Perry, Jr., '45,** director of public relations at WPI....to Tania and **J. Clayton Ney, Jr.,** a daughter, Emily Mary, on December 26, 1982. Ney is vice president of Expanded Rubber Products, Sanford, ME.

Currently, **Gary Babin** serves as an electrical design engineer in the office of facilities at the University of Connecticut in Storrs. Previously, he worked for five years for United Illuminating Co. of New Haven as an associate electrical engineer. He has an MBA from the University of New Haven and is registered as a professional engineer in Connecticut.

Gary Bujaucius was awarded associateship designation in the Casualty Actuarial Society at the Society's May meeting in Miami, FL. He is an actuarial associate with Hanover Insurance Company of Worcester.

Bill Cunningham has joined Data General in Cincinnati.

Dan Hoch is a regional sales representative for IBM's National Marketing Division in Waltham, MA.

Richard Wheeler, who decided late in April to run a write-in campaign for a school committee post in North Brookfield, MA, was elected to the post May 2, winning by 200 votes. Recently he was named product sales manager for Custom Coating & Laminating of Worcester. He is studying for his MBA at Assumption College. The Wheelers have a two-year-old son.

Joseph Williams has been promoted to product engineer in the Abrasives Marketing Group at Norton Company, Worcester. He will provide technical leadership and support for major market programs and determine market and product needs.

1978

MARRIED: Bruce Biederman and Kathleen Miazga in Meriden, CT, on June 4, 1983. Kathleen graduated from Mount Holyoke College and the University of Michigan Graduate School of Public Health. She is with the American Heart Association in Meriden. Bruce works for Pratt & Whitney Aircraft in East Hartford....**Alex Boutsioulis** and Marianne Manfredi on June 26, 1983, in Waterbury, CT. A department manager for Caldor in Hamden, Marianne graduated from Centenary College for Women and Southern Connecticut State University. Alex has an MBA from the University of New Haven. He is an operations engineer for United Illuminating Co....**Earl Potter II** to Gina Lyman in Ludlow, MA. A fiscal assistant with the Head Start program, she graduated from Springfield Technical Community College. Earl, an order processor with Dielectrics, Inc., is attending the evening program at Western New England College.

Jerry Bujaucius is active in CAD/CAM at UNC Naval Products, Uncasville, CT. He is a professor of manufacturing engineering technology at Hartford State Technical College.

Ronald Fish recently became a senior member of the technical staff at Teledyne Systems Company in Northridge, CA.

In May, Dr. **Christo Koulisis** graduated from Albany (NY) Medical College. Currently he is an intern at the Texas University Medical Branch in Galveston, where he plans to complete his residency in orthopedic surgery.

Before leaving Colt Firearms, Hartford, CT, **Richard Skowronski,** as project engineer, was assigned to programs including the improvement of the M16 rifle. The improvement program led to U.S. military type classification of the rifle as the "M16A2" and an $18-million initial contract from the USMC. Rich is now employed as project engineer by Cybex Division of Lumex, Inc., Ronkonkoma, NY. Cybex designs and produces isokenetic test and rehabilitation equipment. Rich has also completed the MBA program at the University of New Haven, West Haven, CT, and has received a professional engineering license from the State of Connecticut.

Brian Timura has received his MD from Tufts University School of Medicine. He will spend his first year of medical residency, with a specialty in internal medicine, at the University of Massachusetts Medical School in Worcester.

Previously with Babcock & Wilcox Co., **Robert Zawistowski** is now the utilities technical and training director for the S.D. Warren Company, a division of Scott Paper.

1979

Reunion **October 1, 1984**

MARRIED: Sandra Dorr and James Wilson in Leicester, MA, on February 26, 1983. She is

a programmer-analyst for IBM in Waltham. Wilson attended Worcester Industrial Technical Institute and is a radio technician for WORAD, Inc., Worcester. . . **Richard Jenkins II** and Kathleen Little in Providence, RI, on April 30, 1983. Formerly with the Providence school department, she graduated from Rhode Island College. Richard is with Turner Construction Co., Columbus, OH.

MARRIED: David Mangini to Lisa Mainiero on May 29, 1983, in Lynnfield, MA. She graduated from Smith College and received her PhD from Yale. David attends the MBA program at the University of Connecticut and is a specialist in cellular radio engineering at Southern New England Telephone. . . .**James Oreutt** to Christine Doherty in Vernon, CT, on June 4, 1983. Christine graduated from the University of Connecticut School of Business . . . .**Stephen Ruseckowski** to Diane Duggan on July 29, 1983, in West Roxbury, MA. **Frank Martin** and **John Fitzgerald** were ushers. Steve is currently at the Sloan School of Management at MIT. . . .**Richard Schneider** and Lea Basso on June 18, 1983, in Westfield, MA. Lea is a graduate of Southeastern Massachusetts University. Richard is a marketing product specialist for Texas Instruments in Attleboro.

Paul Johnson recently graduated from the University of Massachusetts Medical School, Worcester, where he is now serving a five-year surgical residency, which involves four hospitals and a one-year fellowship in vascular surgery. He has coauthored several articles, one of which appeared in *The Journal of Metabolism* last year. A self-taught organist, he has performed at numerous churches, wedding receptions and variety shows.

1st Lt. **Brian Kelley** has entered the Air Force Institute of Technology, Wright-Patterson AFB, OH, where is he studying for his master's in electrical engineering.

Peter Kujawski has been promoted to captain in the U.S. Army. After attending a chemical officer advanced course at Fort McClellan, AL, he will be assigned to the Chemical Systems Laboratory in Edgewood, MD. Recently he received his master's in management at Golden Gate University in San Francisco.

In June, **David Lodigiani** of Loctite Corporation, Newington, CT, left for a six-month stay in West Germany, where he will assist local engineers with a new gasketing technology. Before joining Loctite in 1981, he was with Mobil Corp. Upon completing his Munich assignment, David will relay the new technology to Loctite's affiliates in France and England before relocating to Newington.

Michael Rafa has received his MSME from Northeastern University, Boston. He is a design engineer for the Aircraft Instrumentation Division of GE in Wilmington, MA.

E. Charles Tidman III was recently promoted to loan officer at Mechanics Bank in Worcester. He joined the bank in 1981 as a management trainee in the commercial lending area. Last year he was promoted to assistant loan officer. He has an MBA from Babson and is enrolled at Suffolk University Law School.

1980

MARRIED: Robert Correia and Karen Silvia on June 4, 1983, in Somerset, MA. Karen graduated from Stonehill College. Robert is an electronics engineer. . . .**William Emmet** and Anne Hoskins in New Haven, CT, on June 18, 1983. An alumna of Wellesley, Anne recently completed her first year at the University of Connecticut School of Law. William is an associate mechanical design engineer with Norden Systems, Norwalk, CT. He has a master's degree from Cornell. . . .**James Geist** to Carol Ann Ginty in Danvers, MA, on April 16, 1983. Employed by the Dana Farber Cancer Institute, she graduated from Brandeis. He is with Frequency and Time Systems.

MARRIED: Alan Graham to Sherry Madison in Worcester on November 27, 1982. Sherry graduated from Clark University and is a systems analyst for State Mutual, Worcester. Alan holds the post of personnel manager and marketing specialist with Computer Assistance of East Hartford. . . .**Arthur Huggard** and **Marguerite O'Keefe** on May 7, 1983, in West Roxbury, MA. Marguerite is an industrial service sales engineer at Westinghouse Electric Corporation and Arthur a process engineer at Monsanto Polymer Products Company. . . . **Ronald Lesnikoski** and Lisa Brunn of Los Altos, CA, on June 4, 1983. She is a production planner at Megatest, where Ron works as a product support engineer. . . .**William Mangano, Jr.**, and Janet Sulminski in Worcester on May 22, 1983. An assistant coordinator of the court-volunteers program with Youth Opportunities Upheld, Inc., Janet graduated from Assumption College. He is a programmer analyst at State Mutual. . . .**Ralph Marrone** and **Debra Weidler, '82,** in Westford, MA, on June 11, 1983. She is a mechanical engineer with GE in Fitchburg, MA, and he is an application engineer for Hewlett Packard in Lexington.

MARRIED: John Pierro and **Kathleen Crockett, '82,** in Newport, RI, on July 16, 1983. Kathleen is employed by Polaroid. John, who has a master's degree from Northeastern, is with Honeywell. . . .**Cathryn Ricci** and Mark Giunta in West Warwick, RI, on June 4, 1983. Cathryn is a packaging engineer at Digital Equipment Company. Giunta graduated from Wentworth Institute of Technology and is a designer with Stone and Webster. . . .**Peter Schoonmaker** and Bonnie MacKay recently in Woburn, MA. She graduated from Woburn High School and is employed at Woburn Five Cents Savings Bank. He is with Northern Research & Engineering, Woburn. . . . **John Tasse** to Leslie Ann Stapleton in Southboro, MA, on April 23, 1983. A skin care consultant, she graduated from Sawyer Business School in Albany. Tasse is employed by GE in Schenectady, NY.

Thomas Egan is a project engineer for Axel Johnson Engineering Corp., a Swedish-based company in San Francisco which makes turbines for small-scale hydroelectric projects throughout the U.S.

Tom Fawcett moved to Australia in July. Depending on the job situation, he plans to live there for two or three years.

Kent Larson is studying at Duke Business School.

Margaret Peterson has been named ESD's Outstanding Engineering Management Trainee of the Year. She works in the Department of Manufacturing in Acquisition Logistics and Technical Operations.

Mark Riley received a master of engineering degree from Dartmouth's Thayer School of Engineering in June. He is with Digital Corp., Merrimack, NH.

1981

MARRIED: John DeMasi, Jr., and **Janina Natrillo, '83,** in Meriden, CT, on June 25, 1983. She is an electrical engineer at Sikorsky Aircraft, Stratford, and he is a mechanical design engineer with Norden Systems, Norwalk. . . .**David Ells** and Virginia Duff in Cheshire, CT, on April 30, 1983. An occupational therapist, Virginia graduated from Quinnipiac College. David graduated from Nashville Automotive Diesel College and is co-owner of Cheshire Hardwood Company. . . . **Edward Gonsalves** to Paula Amaral on May 30, 1983, in Somerset, MA. She graduated from Fall River Beauty Academy and is currently with the First Federal Savings Bank. Edward serves as a design engineer for Texas Instruments in Attleboro, MA.

MARRIED: Richard Higger and Linda Harris on June 18, 1983, in Whitinsville, MA. A nurse anesthetist, she graduated from St. Vincent Hospital School of Nursing, Worcester, and St. Raphael's Hospital School of Nurse Anesthesia. Richard is a research assistant at WPI, where he is studying for his master's degree. . . .**Glenn Lawton** and **Susan Thibodeau, '83,** on June 18, 1983, in Marblehead, MA. Susan is a quality control engineer for Sanders Associates in Nashua, NH. Glenn serves as a project engineer for Diamond Electro-Optics in Lexington. . . . **James Roth** to Judith Megill in Oakland, ME, on July 2, 1983. Judith graduated from Becker and is manager of the Winona Knitting Mills outlet in Utica, NY. Roth works for GE in Utica.

Raymond Aubert has taken a new job as mechanical design engineer for the transmission group at GE Ordnance Systems in Pittsfield, MA. Previously, he was an application engineer at the Torrington (CT) Company.

Mark Heinlein is studying for his master's degree at Cornell.

Currently **Lisa Kosciuczyk** is taking classes at California State University at Long Beach, preparing for her professional civil engineer exam in April. She is a senior civil engineering assistant for the Los Angeles County Flood Control District, where she does liaison duties for all construction. Her hobbies include aerobic exercise, ballet and cross-stitch. Last year she was named an "Outstanding Young Woman of America."

Paul Molleur holds the post of chemical process engineer in the technical-development process engineering department at Hercules, Inc./Polymers in Lake Charles, LA. He assists in major cost-savings projects and provides plant engineering support for developmental product trials.

Cliff Weiner is starting his second year in the MBA program at Duke University.

1982

MARRIED: James Auman and **Joyce Trela** on July 9, 1983, in Springfield, MA. She is a project engineer at Hamilton Standard Division

Gertrude R. Rugg

WPI's First Registrar Emeritus Remembers

She may be 95 and recovering from a stroke, but Gertrude R. Rugg is still very much "The Old G.R."—as she calls herself. Miss Rugg, who retired as Registrar Emeritus from WPI in 1959 following forty years of service, now resides at the Holden Nursing Home. Although she is confined to a chair, her memory and sense of humor remain unimpaired.

"I'd still like to plan ahead like I used to at Tech," she says, "but in my present circumstances I can't do that much around here!"

Her happiest memories are of her years as registrar at WPI. "How I loved that job!" she exclaims. "It was my life. I still miss having the students drop by with their problems. I even miss putting together the campus catalog. There was such a spirit of informal formality. Everyone was so cooperative and fond of one another!"

Miss Rugg's understanding and sympathetic advice made her a favorite with both the students and the staff. She was secretary of the Student Committee and belonged to the Scholarship Committee. In 1948 the seniors dedicated *The Peddler* to her. In 1959, the year she retired, she was named the first honorary alumna of WPI on Alumni Day. That same year her name was selected for inclusion in *Who's Who*. Recently, the Gertrude R. Rugg Scholarship for Women was established in her honor.

Miss Rugg, who attended numerous WPI functions during the first eight years of her retirement, still enjoys hearing the latest from "The Hill," whether it be news about her former colleagues or The Plan. ("I'm glad it's working.") However, she does not live in the past. She looks forward to visits from friends and relatives.

"Not many people know this," she confides, "but I was one of the first to discover that the date on the WPI seal was wrong, after looking over the records. It should have been 1865, not 1868." Today the seal stands corrected.

of United Technologies Corp., Windsor Locks, CT. He is a plant engineer at Sherwood Pharmaceuticals, Mahwah, NJ....**Paul Beck** to Lynne Kaczenski in Greenfield, MA, on May 28, 1983. A registered radiologic technologist and graduate of Northeastern University, Lynne is currently working for a degree in health management at Northeastern. Paul is an electronics design engineer at Raytheon Co. in Bedford....**Richard Bolstridge** and Barbara Fleming in South Hadley, MA, on June 4, 1983. Barbara, a social worker in Lynn, graduated from Fitchburg State College. Richard is with Teledyne Engineering Services in Waltham. He is enrolled in a master's degree program at WPI....**Peter Booth** and **Jane Norris, '83,** in Boston on June 4, 1983. Jane graduated as a mechanical engineer. Peter, also a mechanical engineer, is with Colt Industries in Hartford, CT.

MARRIED: John Capurso to Susan McCarthy on April 9, 1983, in Norwood, MA. A registered nurse, she graduated from St. Anselm College and is employed at Glover Memorial Hospital, Needham. He is new products project manager with Data General....**Carl Cianci** and Amy Galante in Newington, CT, on May 14, 1983. Amy graduated from Bay Path Junior College. Carl is with Electric Boat in Groton, CT....**Gregory Fitzgerald** and Renee Cox on May 28, 1983, in Westfield, MA. Renee graduated from Becker and teaches at the Friends of Nathorne DayCare Center. Greg works for GTE in Needham, MA....**Rene Fontaine** and Louise Boissel in Woonsocket, RI, on April 23, 1983. She is a junior at Rhode Island College. Fontaine is an associate engineer with Codex Corp., Canton, MA....**Gregory Green** and **Deidre Malley, '83,** on May 29, 1983, in Harrisville, RI. Gregory is with Computervision Corp. in Bedford, MA.

MARRIED: Brian Haendiges and Annmarie Kelly in Simsbury, CT, on May 28, 1983. Annmarie attended Becker....**Theodore Macutkiewicz** and Cheryl Patterson in Bellows Falls, VT, on May 14, 1983. She graduated from Becker and is an administrative secretary. He is a materials engineer.... **Roy Thompson** to Julie Thurber in Beverly, MA, on April 16, 1983. She graduated from Becker and is a secretary at Sanders Associates, Nashua, NH, where Roy is an electrical engineer.... **Harry Vine** and Abby Friedman on June 5, 1983, in Cresskill, NJ. A graduate of Babson College, Abby is with Bank Leumi in New York. Harry works for Eaton Corporation in Melville, NY.

Chris Lintermann is now with Burns & Roe in Kennerwick, WA.

Timothy Roughan has been promoted to associate consumer service representative at Massachusetts Electric Co. in Hopedale.

Lt. **Peter Roussel,** U.S. Army, is currently residing in Fayetteville, NC.

Klaes Wandland has been commissioned a second lieutenant in the U.S. Air Force upon graduation from Officer Training School at Lackland Air Force Base, Texas.

1983

MARRIED: Robert Charpentier and Karen Batalis in North Brookfield, MA, on April 8, 1983. Karen graduated from Worcester Hahnemann Hospital School of Nursing and is a nurse at the Meriden-Wallingford Hospital, Meriden, CT. Robert is an electrical engineer for Northeast Utilities, Meriden....**John Greenup** to Suzan Hurd in Milton, MA, on July 2, 1983. A mathematics teacher, Suzan graduated from Mount Holyoke College. John is a research and design engineer with RCA in Burlington.... **Vivian Hiscock** to James Podsiadio in Whitinsville, MA, on May 21, 1983. Vivian received her MBA from WPI and graduated from Clark. Podsiadio graduated from Southeastern Massachusetts University and is attending WPI. He serves as a senior design engineer at Data General, Westboro....**Richard Perry** and Amy Taylor on January 8, 1983, in Worcester. She attended Becker and is a student at Anna Maria College. Richard is with Stone and Webster in Boston.

Daniel Alcombright has joined Procter & Gamble in Cincinnati.

David Angelini is currently with the Westinghouse Graduate Placement Program.

Kevin Damon serves as an associate engineer at Hamilton Standard, Windsor Locks, CT.

Patricia Hester works for GTE Sylvania in Natick, MA.

Cynthia Kosciuczyk serves as a research assistant at UMass Medical Center in Worcester.

Jeffrey Labuz, who recently received his MSEE from WPI, has a full fellowship from the University of Virginia where he will conduct research and work toward his doctorate.

The **Douglas Macarthurs,** who were married on May 14, 1983, currently reside in Nashua, NH.

Mark Mungeam is a member of the Berlin, MA, Planning Board and Conservation Commission.

Eric Soederberg has joined the technical staff of Draper Laboratories in Cambridge.

William St. John, Jr., holds the post of customer service engineer at Hewlett-Packard, Logic Systems Division, Colorado Springs, CO.

School of Industrial Management

Clifford Duxbury, Jr., '79, divisional manager of marketing communications at Bay State Abrasives, has been elected president of the Worcester Area Advertising Club. Associated with the abrasives industry for 29 years, he has been with Bay State since 1967....**John Crossman, '83,** who was president of his class and student council president, spoke at graduation ceremonies at WPI last spring. He is supervisor of planning and scheduling at Wyman-Gordon Co., where he has been employed for 27 years.

COMPLETED CAREERS

Wilfred F. Jones, '09, of South Hadley, MA, died on April 1, 1983. A Ludlow native, he was born on Sept. 20, 1887, and graduated as a mechanical engineer from WPI.

During his career, he was with the Riter Conley Construction Co., the Factory Insurance Co., and Springfield (MA) Fire and Marine Insurance Co., from which he retired as secretary in 1956.

Mr. Jones belonged to Theta Chi, the Masons and the Kiwanis Club. He was a charter member of the Western Massachusetts Engineering Society and a U.S. Army veteran.

Edward C. Bartlett, '14, of Tryon, NC, passed away on May 23, 1983. He was born on Jan. 20, 1892, in Worcester and received his BSME from WPI.

Except for two years with Cambria Steel Co. and service with the U.S. Army in World War I, Mr. Bartlett spent his entire career with Wheelock, Lovejoy & Co., Inc., retiring in 1958. For many years he was district manager of the firm's Cleveland and Cincinnati plants and district director and metallurgical consultant.

He belonged to the Society of Automotive Engineers, the American Society for Metals, and the American Society for Steel Treating, as well as Theta Chi, Tau Beta Pi and Sigma Xi.

Franklin C. Gurley, '14, the former chairman of the board of W&F Mfg. Co., Inc., Buffalo, NY, passed away on June 18, 1983, in Lake Wales, FL.

A native of South Willington, CT, he was born on May 31, 1891, and graduated with a degree in chemistry. He joined the former National Aniline Co. in Buffalo as a research chemist and was subsequently promoted to plant superintendent. In 1926 he founded W&F Mfg. Co., Inc., which became the world's leading manufacturer of wax novelties and candles.

He had served as president of Glen Confections, Inc., FGL Realty Co., Buffalo Goodwill Industries, Inc. and Gurley-Sibley Co. Also, he had been a partner in Gurley Novelty Co. He belonged to Sigma Xi, Tau Beta Pi, the Buffalo Club and the Highland Park Club in Lake Wales. The former vice president of the Philadelphia chapter of the Alumni Association, he later served as president of the Western New York chapter. He was the father of **Franklin Gurley, Jr., '43.**

Franklin H. Steele, '14, of Wallingford, CT, died recently.

A native of Bristol, CT, he was born on April 13, 1892. He graduated as a chemist from WPI. During his career, he was with Pennsylvania Salt Mfg. Co., Fansteel Metallurgical Corp. and National Southern Products Corp., from which he was retired as assistant to the executive vice president.

Arthur L. ("Jim") Miller, '15, a long-time agent for New England Mutual Life and an avid golfer, died at his home in Chicago on June 13, 1983, at the age of 90. He was born in Worcester.

Graduated as a civil engineer, he joined New England Mutual Life in 1917 and remained with the firm throughout his career. After initially selling insurance on the streets of Chicago, he decided that the golf course was a better place to promote sales. He continued successfully to sell insurance and play golf until last year.

In 70 years of golf, Mr. Miller was rewarded with six holes-in-one, 15 club championships and the chairmanship of the Illinois Senior Golf Association board. At the age of 72, he was a medalist in the U.S. Golf Association Seniors Championship. He had played with golfing immortals Walter Hagen, Byron Nelson and Ben Hogan. He and his regular partner, Fred Waring, won the Fred Waring Four-Ball tournament four times.

Mr. Miller, a U.S. Army veteran, was a former secretary-treasurer of the Chicago chapter of the WPI Alumni Association and a member of Phi Gamma Delta.

William K. Jealous, '16, of Jacksonville, FL, died May 28, 1983. A native of Pittsfield, MA, he was born on March 22, 1894.

After receiving his BS in chemistry, he spent a year with Mount Tom Sulphite Pulp Co., Northampton, MA. In 1917 he joined the U.S. Army as a lieutenant and served in France. During his career, he was with Carleton & Moffat (foreign trade); Alfred Joensson Co., Inc.; Yglesias & Co.; and Jealous & Massot, New York City.

In World War II, he commanded the 250th Field Artillery Battalion. He saw duty at St. Lo, the Argentain-Falaise Gap and the capture of Strasburg, among other places. In 1945 he retired as a colonel. Among his decorations were the Bronze Star, Medal for Military Merit, French Croix de Guerre with Bronze Star, Silver Star and Palm.

Joseph E. Murphy, '16, a 40-year employee of AT&T, passed away last year in Houston, TX. He was born on May 5, 1894, in Hudson, MA.

He graduated as an electrical engineer and had been employed by American Telephone & Telegraph Co., and Western Electric Co., which he had served as manager of long lines projects. He retired in 1958 as long lines service manager of Western Electric in New York.

During World War I, he was a second lieutenant with the Signal Corps in the A.E.F.

Selden T. Williams, '16, inventor of the tubeless tire "snap-in" valve, died in Southbury, CT, on April 26, 1983, at the age of 91. He was born in Canton, NY.

Mr. Williams held more than 50 patents for inventions for aircraft, sound transmission and tire valves. His "snap-in" valve is used on most tubeless tires. During a 1918 experiment he became the first man ever to fire an air torpedo from an aircraft. He helped perfect the tire inflation of the Army "duck," a strategic World War II vehicle.

In 1916, he received his BSME and began his career as a technical editor and author. From 1917 to 1922 he designed and built planes for the U.S. Navy. Later he became chief engineer for the Victor Talking Machine Company. After twenty years with A. Schrader's Sons, Inc., Brooklyn, the company was acquired by Scovill Manufacturing and he was elected president and chairman of the board. He retired in 1964, continuing as a consultant to Scovill.

Mr. Williams also held a BS and an MS from St. Lawrence University (SLU), which he served as emeritus trustee. He received honorary doctorates from SLU and Pratt Institute. In 1963 he received the Goddard Award from WPI. He belonged to ATO, Sigma Xi, the Masons and the Sons of the American Revolution.

Professor Emeritus **Hobart H. Newell, '18,** who taught electrical engineering at WPI for 44 years, died in Worcester on August 8, 1983. He was 87.

A pioneer in the area of radio communication, Prof. Newell did early research on high voltage phenomena at Westinghouse Laboratories in Pittsburgh, PA, from 1919 to 1921. He helped set up radio station KDKA, Pittsburgh, one of the first stations in the country.

After joining the WPI faculty in 1921, he helped develop the electrical engineering department and served as a consultant on radio technology to several radio stations, including WTAG. He also worked with the City of Worcester developing police, fire and radio communications systems.

Prof. Newell received an honorary doctorate from WPI in 1954. In 1960, he was the first recipient of the Trustees' Award for Outstanding Teaching. The Worcester Engineering Society presented him with its Scientific Achievement Award in 1964.

A native of Cumberland, RI, Prof. Newell was born on June 10, 1896. After receiving his BSEE from WPI in 1918, he joined the U.S. Naval Experiment Station, where he was active in the development of submarine location devices. He belonged to Skull, ATO, Sigma Xi, Tau Beta Pi and Eta Kappa Nu. Also, the American Society for the Advancement of Science, the American Society for Engineering Education and the Society for Computing Machines. A registered professional engineer, he was a senior member of the Institute of Radio Engineers and a fellow of the IEEE.

In 1965, Prof. Newell retired as a professor emeritus from WPI. When the Atwater Kent Laboratories were renovated recently, the lecture hall was renamed in his honor.

Earl A. Winsor, '19, a retired missionary, died at his home in Wheaton, IL, on April 26, 1983. He was 86.

A graduate civil engineer, Mr. Winsor was born in Boston. He had a BA from Wheaton (IL) College and an MA from the State University of Iowa. For many years he was a missionary with the Africa Inland Mission serving as director of education for various schools in the Congo. He also taught history and science at Wheaton College and belonged to Tau Beta Pi.

Albert R. Rienstra, '20, a retired electrical engineer, died August 9, 1983, in Point Pleasant, NJ, at the age of 85. He was a native of Whitinsville, MA.

After receiving his BSEE, he joined the engineering department of Western Electric Co., then became a member of the technical staff at Bell Telephone Labs. He retired in 1957 from Bell Labs, New Providence, NJ, following 37 years of service.

Mr. Rienstra, also self-employed consultant in church acoustics, belonged to the Acoustical Society of America, the Audio Engineering Society and the American Guild of Organists. Other affiliations were with the Telephone Pioneers of America, the Old Guard and the Senior Citizens of Point Pleasant Borough and the Baptist church. He had more than 50 years' experience as a church organist and director. He was the father of **Harold Rienstra, '49.**

Charles D. Gavin, '22, of Fort Myers, FL, passed away recently at the age of 82.

The former manager of Gavin Hardware Company in Leominster, MA, he worked for Remington Arms Co., Bridgeport, CT, and Phillip Carey Co., from which he retired as purchasing agent after 24 years of service. He studied mechanical engineering and was a member of Phi Sigma Kappa.

Weston Hadden, '22, A long-time employee of New York Telephone Co., died on June 14, 1983, at his home in Old Bennington, VT. He was 86 and a native of Brooklyn, NY.

He graduated as an electrical engineer. Originally with Western Electric, he worked for the New York Telephone Co. from 1922 until his retirement in 1952.

He belonged to ATO, the IEEE, Institute of Radio Engineers, Radio Club of America and the U.S. Power Squadron Club. Also, the Municipal Club of Brooklyn and the Brooklyn Association for Improving Conditions for the Poor. A trustee for the village of Bennington, he was active with the local library club, the Red Cross, Old First Church and the Rotary. In World War I, he attended Naval Officers Training School.

Richard Williamson, '22, of Newton Centre, MA, died on September 22, 1982. He was 80.

A member of the Class of 1922, for many years he was superintendent of engineering at Hood Rubber Co., Watertown, MA. He belonged to ATO and the Tech Old-Timers.

Axel F. Nilson, '24, died in Branson, MO, on March 25, 1983. He was born on Nov. 13, 1898 in Brooklyn, NY.

Mr. Nilson had been employed by Charles H. Tenney & Co., Coral Gables Corp., Gannett, Seeley & Fleming Co. and Cayuga Rock Salt Co. He was a retired sales engineer from Cargill Salt Co. In World War I he served in the U.S. Army. He belonged to Phi Sigma Kappa.

Louis Corash, '25, of Huntington, NY, passed away recently. He was born in Worcester on November 7, 1903, and graduated as an electrical engineer from WPI.

In 1928, he received his LLB from New York Law School. During his career he was with New York Edison, Alfred Becker Engineering, Ornstein & Silverman and Estellite Corp. For years he was a self-employed attorney. During World War II, he was a technical adviser to the U.S. Signal Corps. Most recently he was with Hotel-Motel Real Estate Investments. He was a member of AEPi.

Kenneth R. Archibald, '26, a former veteran employee of the New York Telephone Co., died in Naples, FL, on April 28, 1983. He was born in Ludlow, VT, on June 23, 1902.

After receiving his BS in chemistry, Mr. Archibald joined New York Telephone Co. from which he retired in 1967 following 41 years of service. During his career with the company he had been a manager and commercial supervisor.

In retirement, he was named executive director of the Ludlow (VT) Chamber of Commerce and subsequently, the executive vice president of the Springfield (VT) Chamber of Commerce. He held the latter post until 1981. He was active with Rotary International and was a Paul Harris Fellow.

Mr. Archibald, a member of Phi Gamma Delta, was a past vice president of the Schenectady chapter of the Alumni Association, and former president of the Lake Rescue Association and the Vermont Association of Chambers of Commerce.

Ormond J. Chinnock, '26, of Livermore, CA, a retired sales representative for Hercules Powder Co., died recently. A native of Cleveland, OH, he was born on May 24, 1903.

Mr. Chinnock was a graduate chemist. Except for two years when he had his own business and one year when he was with Apache Powder Co., he spent his career with Hercules Powder Co. He retired as the supervisor of senior chemical and technical sales at the firm's Hercules, CA, branch.

He belonged to the AIChE, the Masons, Lambda Chi Alpha and Sigma Xi, and he was a former member of the President's Advisory Council at WPI.

Donald L. Hager, '26, former sales manager for the H.A. Johnson Co., died July 2, 1983, in New Hartford, NY, at the age of 79.

A mechanical engineer, he had been with the Johnson company and had operated a Maico Hearing Aid business. He retired in 1959.

He was a member of Theta Chi. Active with the Masons, he earned the 32nd degree, was a chief marshal, and was given a meritorious service award. He headed many functions for Ziyara Temple. Other affiliations were with the Presbyterian Church, Rotary (Paul Harris Fellow) and Salvation Army.

Robert O. Wright, '26, died in Knoxville, TN, on December 3, 1982. A native of Natick, MA, he was born on April 2, 1903.

Graduated as a mechanical engineer from WPI, during his career he was with Sullivan Machinery Co., Brooks Equipment, Valley Materials Handling, Inc., and the Indoor Gardener Publishing Co., which he served as treasurer. He was a member of Phi Sigma Kappa.

Arthur W. Knight, '29, class president, WPI Trustee Emeritus, and a past president of the Alumni Association, died at his home in St. Johnsbury, VT, on August 3, 1983, at the age of 77. He was born on April 6, 1906, in Boylston, MA, and was a graduate electrical engineer.

He had been with Western Electric Co., L. Bamberger & Co., R.H. Macy, Cormac Corp. and William Allen Son's Company, Worcester, which he served as president. In 1956 he organized A.W. Knight Co.

Mr. Knight was a former director of the Worcester Chamber of Commerce and chairman of the Chamber's small business committee. As a resident of Shrewsbury, he had served on numerous town committees and was a past president of the Shrewsbury Historical Society. A Vermont resident since 1962, he was a former official in town government and an active member of the Congregational Church.

He belonged to Theta Chi, Skull, the Masons and the Rotary Club. He had served WPI as chairman of the Techni-Forum Committee, vice president of the Northern New Jersey chapter of the Alumni Association, Alumni Council member from Worcester and president of the Alumni Association. In 1964 he received the Herbert F. Taylor Award for distinguished service to WPI.

Clayton B. Marshall, '29, of Monterey Park, CA, a retired chief chemist from Mobil Oil Corp., died in February. He was born on May 8, 1907, in Westboro, MA.

During his many years with Mobil, he was a group leader, senior chemist and chief chemist.

With a degree in chemistry, Mr. Marshall was a member of Sigma Phi Epsilon. He served with the U.S. Army in World War II, rising to the rank of captain.

C. Eugene Center, '30, a long-time employee of Westinghouse, died June 9, 1983, in Mt. Lebanon, PA. He was born July 7, 1908, in Boston and graduated from WPI as an electrical engineer.

During his Westinghouse career, he worked in East Pittsburgh, PA, Boston, MA, and Augusta and Portland, ME. At one time he was with the Bettis Atomic Division in West Mifflin, PA. He retired in 1971. A member of the American Association of Cost Engineers, he also belonged to the AIEE, the American Nuclear Society and ATO.

Active in alumni affairs, Mr. Center received the Taylor Award in 1974. He was the first chairman of the Alumni Trustee Search Committee, a past president of the Boston and Pittsburgh chapters of the Alumni Association and a member-at-large of the Alumni Executive Committee. He was a former class officer, Alumni Fund captain and member of the Alumni Council.

William H. Doyle, '30, of Simsbury, CT, who was recently named a fellow of the American Institute of Chemical Engineers, died on March 27, 1983. He was 75 years old.

He was born in Bantam, CT, on Dec. 28, 1907. Graduated with a chemistry degree from WPI, he was employed as a chemical engineer by Industrial Risk Insurers of Hartford, where he worked for more than 40 years prior to his retirement in 1972.

Mr. Doyle belonged to the National Society of Professional Engineers and recently received a distinguished service award from the National Fire Protection Association. He wrote sections of the *Fire Protection Handbook*. This year he was named a fellow of the American Institute of Chemical Engineers in recognition of his work in accident protection and worker safety.

He belonged to Lambda Chi Alpha and was active with the Congregational Church and the Masons.

Norman L. Shaw, '30, of Riverside, CT,

passed away on January 5, 1983. A native of Holyoke, MA, he was born on June 22, 1905.

He received his BSME from WPI. For many years he was manager of the marine division of Farrel-Birmingham, Co., Ansonia, CT, from which he was retired. He was a member of Phi Gamma Delta and Sigma Xi.

Leonard H. Peters, Jr., '32, of Lenox, MA, died last year. He was born in Lenox on August 24, 1911.

A graduate civil engineer, he was a retired business officer for Lenox School for Boys. Previous employers were National Alliance of Businessmen, Inc., and American Airlines, which he served as assistant to the president. He belonged to Phi Sigma Kappa.

Julius L. Gould, '34, of Cohasset, MA, former vice president of Harold A. McCrensky & Associates, Boston, died recently. He was born on Dec. 11, 1912, in Greenfield.

An electrical engineer, Mr. Gould had been employed by Railway & Light Securities, Pitney-Bowes, Westinghouse, Bruce Payne & Assoc., Philips Elmet Corp., Wallace Clark & Co. and Amrhein & Gould (consultants).

He was a member of Phi Sigma Kappa and the Masons and held an MBA from Harvard Business School.

Russell W. Fargo, '35, a veteran employee of the New York-New Haven Railroad and resident of Chester, CT, died in the Middlesex Memorial Hospital on May 29, 1983, following a long illness. He was 69 and a native of Chester.

He received his BSEE from WPI. After 20 years with the railroad, he joined Pratt & Whitney Aircraft as a chemical testing engineer. During World War II, he was in the U.S. Army.

Frederick W. McIntyre, Jr., '35, previously vice president and director of Reed-Prentice Corp., died at his home in Worcester on May 22, 1983, at the age of 71.

A Chicago native, he was a student of mechanical engineering at WPI. During his career, he was with Universal Winding Co., Neff, Kohlbusch & Bissell, Reed-Prentice Corp. and McIntyre Machine Sales Co., Worcester, which he served as plastics engineer and treasurer. He was a director of Coes Knife Co. and a corporator and advisory board member for Worcester Goodwill Industries.

Mr. McIntyre was a past assistant treasurer and vestryman of St. Luke's Episcopal Church and a founder of the Tatnuck Ecumenical Association. He belonged to the Society of Plastics Engineers, the Masons and the Shrine and The Tech Old-Timers. He attended the University of Cincinnati.

Andrew W. Palm, '35, a retired senior staff engineer for Stanley Tools, died in New Britain, CT, on April 6, 1983. He was born in Milford, MA, on March 12, 1913, and received his BSME from WPI.

For 48 years he was employed by the Stanley Rule and Level plant of the Stanley Works, retiring in 1977. During his career, he was a division superintendent and industrial engineer. As chief project engineer, he helped design and construct the new Stanley Tools plant.

Following his retirement, he was a manufacturing lines consultant in Mexico, Venezuela, Brazil and Colombia.

An Army veteran of World War II, Mr. Palm belonged to the American Legion, the American Electroplaters Society, Society of Manufacturing Engineers and the Stanley Works Management Association. He was a member of the Episcopal Church.

Stanley J. Sleczkowski, '35, died in a fire at his home in Framingham, MA, on April 2, 1983. He was born April 20, 1913, in Fulton, NY.

A graduate civil engineer, he had been employed by Socony-Vacuum Oil, the Metropolitan District Water Supply Commission in Framingham, MA, and Stone and Webster, Boston.

Arthur H. Rand, '39, died in New London (NH) Hospital on May 15, 1983, at the age of 66. He was a native of Portsmouth.

After graduating with his BS in chemical engineering, Mr. Rand joined Fraser Paper Ltd., Madawaska, ME, as a mill engineer in 1940. Later he was advanced to chief service engineer. He retired last year.

In World War II, he was a captain in the U.S. Air Force. He belonged to the American Legion and Phi Gamma Delta.

Robert W. Tuller, '41, was killed in a tractor accident at his farm in West Simsbury, CT, on June 16, 1983. He was born in Hartford on March 28, 1920, and received his BS in chemical engineering in 1941.

Mr. Tuller was a co-operator of Tulmeadow Farm, the only working dairy farm in Simsbury. The farm has been in the family for more than 200 years.

A former member of the state legislature, Mr. Tuller served on the local board of selectmen, the school building commission, and the Charter Revision Commission. He was a charter member of the local Grange and was active with 4-H, the fire department, Methodist Church, Simsbury Village Water Co. and the Farm Bureau. In World War II, he served overseas with the Army Air Force 21st Weather Squadron. He belonged to SAE.

William J. Bielauskas, '43, a military munitions engineer, died March 18, 1983, in Pompton Plains, NJ, at the age of 62.

He was a native of Worcester. During World War II, he was a C-47 pilot with the Army Air Corps in the China-Burma-India theater of operations. He attended the University of Michigan.

Leroy C. Doane, Jr., '48, president of the L.C. Doane Co., died at his home in Essex, CT, on March 20, 1983, following a long illness.

He was born in Cleveland, OH, on Sept. 14, 1922. Graduated as an electrical engineer, he joined the company his father founded. The company designed and produced the lighting fixtures used on the original nuclear powered submarines, as well as other fixtures, primarily for the government and the U.S. Navy.

In World War II he served in the U.S. Army. He was a member of SPE.

Thomas F. Hunter, '48, of Rutherford, NJ, died of a heart attack on May 9, 1983. A native of Mt. Vernon, NY, he was born on Nov. 18, 1926. He was a graduate mechanical engineer.

During his career, he was with Federal Tel. & Radio, Clifton, NJ, and the Pitometer Co., New York City, where he was a field engineer. At the time of his death, he was an applications engineer for Walter Kidde & Co., Inc., Belleville, NJ. He belonged to Phi Sigma Kappa and was the son of **Russell Hunter, '15.**

Arthur R. Murphy, '50, former president of Murphy Associates, died in Lawrence, MA, on May 29, 1983, at the age of 60. He was a graduate civil engineer and a Lawrence native.

Most recently, he was vice president of the Massachusetts Building Commissioners and Inspectors Association and a building commissioner for the City of Medford. Earlier he had been with the Massachusetts Department of Public Works and Libbey Owens Ford Glass Co., where he served as a sales engineer.

Mr. Murphy, a registered professional engineer, was a past president of the Boston chapter of the Producers' Council, Inc. He belonged to ATO, the Boston Society of Civil Engineers, the Knights of Columbus, the Elks, and the American Legion. He attended St. Patrick's Church.

In World War II he was with the U.S. Air Force. He was a former member of the Boston branch of the WPI Alumni Executive Committee.

Richard V. ("Ollie") Olson, '54, assistant professor of mathematical sciences at WPI, died in Johns Hopkins Hospital, Baltimore, on August 25, 1983. A Worcester native, he was born on Dec. 26, 1932. He was the brother of Dr. **Edward C. Olson, '52,** of Urbana, IL, and Donald H. Olson of Augusta, GA.

Ollie began his WPI career in 1962 as an instructor and was promoted to assistant professor in 1977. A campus favorite, well known for his ever-present "stogy," he developed a close rapport with his students and maintained many friendships with alumni. He and "Jean Claude Kitty," his independent, geriatric cat, often hosted informal, student-alumni get-togethers at their home at 2 Sun Valley Drive.

Dr. Edmund Cranch, WPI president, said of Olson's death, "Ollie will be fondly remembered as a friend who always had the time to talk with his students. Perhaps more importantly, he had the time to listen to them."

Bill Trask, director of graduate and career plans, added, "We at WPI will miss Ollie, but we were fortunate to have known him as a colleague and a friend. He was unique. Future students will never have the opportunity of sharing the rare teacher friendship which was his hallmark. That is unfortunate."

Ollie had served as a faculty adviser to Alpha Chi Rho Fraternity and as a former adviser to the WPI Crew Club. The Crew Club named one of its first new shells in his honor. Believing that there was a need for faculty and students to socialize outside of the classroom, he was instrumental in launching the Goat's Head Pub on campus. He also belonged to Skull.

Prior to joining the teaching staff at WPI, Ollie was a research assistant at the Woods Hole Oceanographic Institute on Cape Cod. He received a BS in physics from WPI, studied at Yale and Rutgers, and in 1961 earned a master's degree from Clark. During a sabbatical in 1975–76, he studied with the eminent statistician Raymond H. Myers at Virginia Polytechnic Institute and State University in Blacksburg.

More than 20 freshmen at Orientation this year were second generation WPI students. Pictured here are WPI alumni with their families and freshmen sons and daughters. Row 1: Robert W. Meyer '54, WPI President Edmund T. Cranch, Francis W. Madigan, Jr. '53. Row 2: Joseph J. Mielinski, Jr. '63, Robert E. Maynard '63. Row 3: Nathaniel M. Johnson '60, Robert H. Whyte '61. Row 4: Jan W. Moren '66, Donald J. Richards '59. Row 5: Williams S. Brower, Jr. '58, Paul J. Keating '64, Benjamin D. Brunell '64. Row 6: Paul R. Jolicoeur '60, Brian J. Kelly '55. Row 7: John W. Oldham, Jr. '65, Charles A. Whitney '57. Missing when photo was taken, the families of: George F. Bastien '62, Richard J. Bouchard '59, John D. Jennings '58, Peter Marston '64, Christopher F. Martin '53, Michael F. Oliver '65, Donald R. Olsen '56.

Ollie was a former president of the Citizens for Neighborhood Improvement and a past director of the Worcester Beautification Council. He belonged to the ASEE, the Mathematical Society of America, the American Mathematical Society and the American Statistical Association. He was active with the Congregational Church and participated in Republican politics. In 1963, he was a candidate for the Worcester School Committee.

A final, fitting tribute to Ollie came from an alumnus: "If it hadn't been for the extra tutoring I got from Ollie, I might never have graduated from WPI. He always found time to help those in academic difficulty, not because he had to, but because he wanted to. That was the way he was."

An evening memorial service for Ollie was held at Alden Memorial on Sept. 1, with Father Peter Scanlon assisting.

Dr. **Eugene N. Wood, '64 MNS,** dean of students at Lowell High School, died March 22, 1983, in Boston, MA, at the age of 48. He was born in Lowell on June 6, 1934.

He joined the Lowell school system in 1956 as a chemistry teacher. Subsequently he was named floormaster and dean of students.

Dr. Wood held a BS from Boston College and a law degree from Suffolk Law School. He was a U.S. Army veteran, as well as a member of St. Michael's Church, the Elks and the Massachusetts (and National) Teachers Associations. He had served as a Little League umpire.

Donald E. Morrisette, '66 SIM, a veteran employee of Fenwal Corporation, died March 26, 1983, in Brigham and Women's Hospital, Boston, following a long illness. He was a native of Exeter, NH.

Besides WPI, he attended Northeastern University, Wentworth Institute of Technology, Worcester Junior College and the Cambridge Institute of Marketing. He joined Fenwal in 1942 and retired several years ago as field sales manager.

After service with the U.S. Navy in World War II, he and others who had served on the *USS Enterprise* in the Pacific received the Congressional Medal of Honor.

Mr. Morrisette, who had served on the Hopkinton (MA) Finance and Appropriations Committees and the Planning Board, was previously active with the Little League and the Boy Scouts.

James F. Brennan, '77, of Leicester, MA, died March 26, 1983, in a fire that destroyed a summer home in West Rindge, NH. He was 28.

At the time of his death, the Worcester native was working at Spag's. While at WPI, he had belonged to the varsity basketball and baseball teams.

He belonged to St. Joseph's parish, Lambda Chi Alpha Fraternity and the Celtic Standard Folk Band.

Judith O'Coin, '85 MGE, of Spencer, MA, was a big help in mobilizing the 75 student volunteers who phoned some 600 graduates for the Alumni Readership Survey.
Read the results on page 6.

WPI Journal

WORCESTER POLYTECHNIC INSTITUTE FEBRUARY 1984

WPI's Foreign Students
COOP—The Eight-Month Energizer

WPI Journal

WORCESTER POLYTECHNIC INSTITUTE

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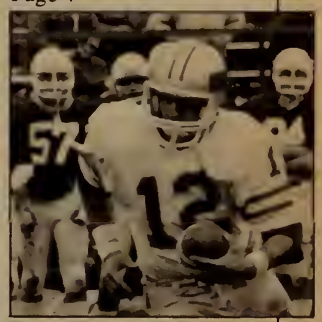

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Cover: A fresh snowfall blankets the east entrance of Alden Memorial. Meanwhile, Maura Mastrogiovanni (opposite) uses a break in the weather for more leisurely pursuits (Chuck Kidd photo).

A Gift of Magnificent Proportions: The Walter and Miriam Rutman Scholarship

WPI's largest-ever donation for scholarships comes from a Depression-era alumnus who everyone thought had forgotten his alma mater.

By Michael Shanley

The letters are 50 years old now, and the pages have yellowed with age, but the words have lost none of their urgency.

The story told is of a young man anxiously searching for work in a dismal job market. His correspondence is with a job placement contact at his alma mater. The year is 1934.

(March 1) *Contact:* There is a possible opening. . . . I have written to suggest your name. . . . If you are interested, write or phone Mr. Merrill immediately."

(March 6) *Young Man:* On receiving your letter, I immediately telephoned Mr. Merrill only to learn that the position had been filled. Your lead, although it proved disappointing, was encouraging.

(Sept. 6) *Young Man:* I still need a job; and necessity will soon place me in an awkward spot. I have managed an irking sustenance by sundry odd jobs. . . . How do things appear?

(Sept. 11) *Contact:* We haven't had wind of anything during July and August. But I am confident there will be need for more men this fall.

(Nov. 4) *Young Man:* Thank you for your letter of recommendation, but the firm was unable to raise the necessary funds and the high enthusiasm dwindled quickly. . . . I need a job badly. . . .

The young man did get a job. He worked hard. He prospered. His alma mater heard little from him over the years, but the young man had not forgotten.

His name was Walter Rutman, Class of 1930. He died last year at the age of 74. In his will, he left WPI $1.5 million. The money, he specified, is to be used "for scholarships for needy students."

Rutman owned the *Rhode Island Herald* newspaper, and he was owner and president of the Herald Press and the Ondine Publishing Company, both in Rhode Island. He was the former owner of the *East Providence Post* and the *Seekonk*

(Mass.) *Star*, both weekly newspapers.

Rutman's wife of 45 years, Miriam, says her husband never kept in touch with anyone at WPI because "That's the way he was, a very private man." But he did remember the school fondly. "He always felt he got an especially good education there."

By earmarking the money for scholarships, Rutman may have been trying to lighten for others the burden he himself shouldered at WPI. He put himself through school, in part by working as a correspondent for the Worcester *Evening Gazette*. This introduction to journalism would later serve him well.

Upon his graduation in 1930, the young chemist found a job with Chase Copper and Brass Company in Waterbury, Conn. When the economy failed to rebound during the early years of the Great Depression, the company was forced to lay off workers, and Rutman, still single then, was without a steady job. "They only kept the men who had families to support," says Mrs. Rutman, who married Walter in 1938.

Rutman soon moved to Providence, where he had relatives, and persevered through a series of odd jobs. Then, in 1935, his fortune began to change. He and a partner bought the struggling *Jewish Herald* newspaper.

In those early days at the *Herald*, Rutman was troubled by a nagging problem: he couldn't find a printer whose standards of quality and speed met his own. Says Arthur Lemoi, who worked with Rutman for nearly 25 years and now runs the business for Mrs. Rutman, "He didn't want to print his paper when somebody else was ready. Finally he just decided to do it himself." Thus was born the Herald Press.

It was at this point that Rutman, who by now had bought out his partner and was sole owner of the *Jewish Herald*, took what others saw as a foolish gamble: his printing company was among the first to adopt the new offset printing process, a controversial alternative to the traditional letterpress procedure. There were those who predicted disaster. Now, of course, offset is the industry standard.

In later years, he brought in the web press, phototypesetters and OCRs (optical character readers). "We were using the computer in the mid-'60s—long before most publishers," says Lemoi.

In the 1960s, Rutman formed the Ondine Publishing Company for retail publishing accounts. He also bought the

Walter Rutman, Class of 1930. Opposite: Mrs. Miriam Rutman and Kathy Kruczek, '84 ME, of the Student Alumni Society, at a ceremony announcing the fund.

East Providence Post and started the *Seekonk Star*. "At one time or another, the company printed almost every community newspaper in Rhode Island and southeastern Massachusetts," says David Howard, who worked as an editor for Rutman and now publishes the *Post* and the *Star*.

Of Rutman's editorial stance, Howard says, "He looked at the community newspaper as a source of hometown news with as much emphasis on the person who was promoted in his or her job, as on what was happening with the zoning board." His papers earned a reputation for fairness and accuracy of reporting as well as for excellent printing.

Rutman's passion was his work—seven days a week. "He was tough, but he was a straight shooter," says Lemoi.

Rutman's drive and determination carried through all he did, business or pleasure. Tony Caranci, golf course superintendent at Ledgemont Country Club, got to know him well, because Rutman was Ledgemont's greens committee chairman for many years.

"I'd see him out on the course almost every morning," remembers Caranci. "And I mean early—six o'clock or before—just him and my sprinklers."

Later, nearing 70, Rutman found a new interest—canoeing. As usual, he went all out.

"One night I got this call from a total stranger," recalls Manny Point, founder and past president of the Rhode Island Canoeing Association. "He said he was going on a canoe trip to the Allegash Wilderness Waterway in Maine, and he wanted to learn everything about the sport." Point agreed to give the stranger a few tips.

"When I saw this thin older man walk up, I began to wonder what I had gotten myself into. But he was stronger than he looked and he worked very hard. He came back from that first Maine trip happy as a baby. What he remembered most about WPI was the professors he had. He spoke highly of them."

Rutman's education never really ended. The Rutmans were active members of the Providence Athenaeum, one of the oldest private libraries in the country. The Athenaeum staff remember him as a very quiet man. And, quietly, he left the Athenaeum $50,000, the largest gift the library has ever received.

"His devotion to the Athenaeum surprised even me," says Mrs. Rutman, who is still a regular there. Nor was she aware of the great extent to which he had helped Trinity Square Repertory Company, Providence's theatre group.

Marion Simon, assistant to Trinity director Adrian Hall, calls Rutman ". . . the greatest benefactor we had. He printed all our programs and never asked for the money we owed. He had a deep sense of what was right and wrong."

It was this sense, one can surmise, that moved this quiet, intensely private man to provide generations of students with an opportunity they might otherwise be denied. Scholarships for needy students are important, Walter Rutman might say. They are "right."

At the public announcement of the Rutmans' magnificent gift, held at WPI on October 12 and attended by Mrs. Rutman and some 200 students, faculty and friends of the college, President Edmund T. Cranch declared, "This gift, establishing the Walter and Miriam Rutman Scholarship Fund, will enable WPI to lighten the financial burden many of our students are forced to bear."

Said Robert F. Reeves, Vice President for Student Affairs, "The nation can ill afford to have qualified students miss getting the highest quality scientific and technological education because of insufficient resources. Similarly, WPI cannot let the quality of our student population be determined by their ability to pay."

"The Rutmans," added Dr. Cranch, "recognized that education is the common currency of democracy."

It's My World and It's Yours, Too.

Students from nearly 50 countries bring to WPI a rich tapestry of backgrounds. But for some, the road home may be treacherous.

By Michael Shanley

Kiet remembers the guards' submachine guns reflecting in the moonlight as he and hundreds of others boarded the rusted fishing boat that night.

He was too young then to be properly terrified, too young to realize how many "boat people" never saw land again. He was unaware how many fell victim to foul weather, unsafe boats and marauding pirates.

Kiet's father had been trying to get the family out of Vietnam for four years—ever since the communists took Saigon in 1975.

The boat trip was a final act of desperation, a long and arduous journey undertaken only as a last resort. Efforts at securing forged papers that would have allowed the family to leave by air had failed. So had the other alternatives Kiet's father had explored. He had dealt with a number of seedy characters peddling empty promises. Most had simply stolen his money and fled into the Saigon underworld.

If other possibilities for escape even existed, there was, suddenly, precious little time. The family was being followed by the secret police—had been, they were chilled to learn, for more than a year.

It was time for drastic action: it was time to secure a boat.

A group of friends banded together and purchased the iron-hulled fishing boat that would take them to Hong Kong. The proper officials were bribed, the plans were made. Papers were forged so that relatives, and not the government, would get their house and belongings.

Now the Hoangs—Kiet, his parents, two brothers and a sister—were set to leave their troubled homeland. For Kiet, that homeland represented a jumbled mixture of memories. There were the good times: the family gatherings, the childhood friends, the sheer excitement of growing up. But there were also horrors like the Tet offensive of 1968, with bombs dropping across the river and hills of human bodies piling up on the roadside.

At WPI (from left): Lisa Lee, '87, New York City, formerly from Hong Kong; Carlos Gutierrez, '87, Guaynabo, Puerto Rico; Luis Quijano, '86, Panama City, Panama.

All in all, Kiet was glad to be leaving, glad because it meant not having to anxiously await the arrival of his father each evening. The entire family had come to live vicariously through Mr. Hoang, waiting to see the expression on his face when he came through the door at the end of the day. A smile meant he had a lead on some means of escape; it meant hope. If there was no smile, well, things had gone poorly, another plan had fallen through, another hope had been dashed.

More than 400 people were crammed into the boat that night as it slipped without incident off into the moonlight. For nine days they huddled together, eating only rice. Twice they bypassed Hong Kong by mistake. They spent an entire day hopelessly lost somewhere off the coast of mainland China. Another day, the boat was nearly destroyed in a ferocious storm.

But in the end, the Hoang family were survivors. They finally landed on the shores of Hong Kong, where they lived with relatives for five months. Eventually, they came to the United States and now live on Cape Cod.

Kiet is a sophomore computer science major at WPI. If his past differs greatly from that of most students, then he serves as an excellent illustration of the one overriding tie that binds the WPI foreign student population: they bring to the campus a richly textured background often unfamiliar to American students.

About 280 foreign students from 46 countries are currently enrolled at WPI—about 7.3 percent of the full-time population. Of these, about 125 are graduate students. More facts:

As might be expected, figures nationally vary greatly. According to the Institute of International Education, foreign students represented 2.7 percent of the total U.S. higher education enrollment for the 1982–83 school year.

Miami-Dade Community College headed all others with 4,186 foreign students enrolled. The University of Southern California and University of Texas at Austin were next in line. Northrup University, in Inglewood, California, claimed the largest percentage of foreign students—70.5 percent, followed by Southeastern University, in Washington, D.C., where 64.9 percent of the students are foreign.

Massachusetts, with more than 16,000 foreign students, was ranked fifth in the country in total number enrolled, behind California, New York, Texas and Florida. MIT's foreign-student enrollment for 1982–83 was 20 percent of MIT's total enrollment, BU's was 7.8 percent and Harvard's was 12.5 percent.

Nearly a quarter of the national foreign student population studies engineering, making it the most popular field of study.

The largest single group of foreign students in the U.S. comes from Iran. Out of a total foreign student population of 336,985 in 1982–83, more than 25,000 were Iranian. That number, however, represents a 50 percent drop from the 1979–80 school year.

In the last decade, students from Iran made up a large block of the WPI foreign student population, but, following the national trend, their numbers have dipped sharply in recent years. The number of Iranians enrolled as full-time undergraduates at WPI plummeted from 49 in 1979–80 to 28 in 1982–83 to 12 in 1983–84. Moreover, there are no Iranian students in this year's freshman class.

It's not hard to see why. Iran has been in turmoil since the revolution of 1978, when the Shah was overthrown and the Ayatollah Khomeini seized power. In addition, the current war with Iraq has destroyed students' plans to study in the U.S.

Iranian students at WPI have felt the crunch. Many live in a troubling twilight of uneasiness that most American students can only imagine. For some, the phrase "you can't go home again" is chillingly real.

One student, who for obvious reasons chooses not to be identified, admits to having participated in the 1978 revolution. Now he regrets it.

"At the time, it seemed the right thing to do," he says. "So many of those in power—the wealthy—were corrupt. But now it's much worse."

He tells of letters from home always arriving opened, of phone calls being bugged. There is even concern that a government informant could be planted here at WPI. Despite the fact that his family is still in Iran, this student vows not to return while Khomeini is in power.

"There's no future for me there," he says. "My friends who stayed in Iran are now in the army or working at odd jobs. Their talents have been totally wasted. The universities there are a joke now. Everything is political."

He knows horror stories of imprison-

ment and harassment, torture and execution. "One letter—" he says, "if it goes to the right person—is enough to get someone hanged."

Dean of Students Bernard H. Brown, who is responsible for the undergraduate foreign student program at WPI, says that Iranian students who want to remain in the U.S. after graduation must enroll in a graduate program, apply for one year of practical training experience, or apply for political asylum.

"And if they do apply for asylum," says Brown, "then their family back home could be in danger because an application for asylum is considered a denunciation of the Ayatollah."

Fortunately, most foreign students don't face such troubling decisions. For many, cultural adjustments are the biggest hurdle. To offset potential problems of that kind, Dean Brown and his staff offer a special orientation program for foreign students enrolled in the freshman class. People like Dean John van Alstyne, Registrar Robert Long and oral communication specialist Kay Draper participate and explain programs informally to the students.

"Things we take for granted—speech, transportation and religious practices, for example—can be a real problem for some of these students," says Dean Brown.

One recently developed resource is the WPI *International Student Handbook*, completed in the summer of 1982 as an IQP by two undergraduate foreign students, Luis Anez and Jorge Castillo. Dean Brown's staff updates it annually and distributes it at the orientation. In addition to explaining the facilities at WPI, the handbook offers practical advice on everything from how to open a checking account to when to give someone a tip.

One major purpose of the orientation is to test a student's spoken English and to offer help if it's needed. That help often comes in the form of enrollment in one of Kay Draper's public speaking classes. Mrs. Draper uses WPI's audiovisual facilities to tape each student as he presents speeches during the course of a term.

"The difference between the first and the last taping is phenomenal," she says.

Students who have come in contact with Mrs. Draper speak glowingly of her, not just as a teacher, but as a person, a friend and a shoulder to cry on. Mrs. Draper, in turn, credits the entire WPI community with making foreign students welcome.

"Everyone," she says, "from the deans to the faculty and staff to the American students, has done a fantastic job. WPI is known for its treatment of foreign students. People here care; they take the time. I've known of secretaries—who have God knows how many other things to do—struggling for 20 minutes to understand a foreign student's problem."

Mrs. Draper, whose dealings with Chinese students earned her a six-week teaching trip to China last fall, views treatment of foreign students as having repercussions far beyond WPI's boundaries.

"In a very real sense, world policy of tomorrow depends on what we do today. The students who come through our doors are tomorrow's leaders, and the first impression they get of this country is here."

Reviewing videotapes of speeches presented by students in Mrs. Draper's class illustrates another aspect of the foreign student population: many seem more alert to political and social realities than their American counterparts. Witness Mrs. Draper's students arguing global politics, the plight of the industrial worker and neglect of the elderly.

Lisa Lee, originally from Hong Kong and now a resident of New York City, speaks passionately about world hunger, about the fact that many Americans take for granted the kinds of meals that millions of children around the world never see. At the end of her speech she sings, in a strong voice and without a trace of self-consciousness, the words to one of her favorite songs: "It's my world and it's yours, too, and there's a lot we both can do if we try. . . ."

Carlos Gutierrez, from Puerto Rico, gives his talk on the United States and its involvement with Third World countries. He is an unabashed apologist for nonaggression. Luis Quijano, a Panamanian, knowingly discusses communism in Central America: how, for example, the peasants view the superpowers jockeying for position.

Contrast this with a recent poll taken by editorial writers at the *Worcester Telegram*. Students from five area colleges (Assumption, Clark, Holy Cross, WPI and Worcester State) were asked questions on history and current events. Results showed that only a third of the students could name the U.S. Senators from their state. Fewer than 30 percent could identify U.S. Secretary of State George Schultz. One senior at WPI, after placing the finish of World War II in 1952, was quoted as saying of wars, "They're nothing I ever bothered to pay attention to."

In addition to speech classes, Dean Brown's office makes a number of other services available to foreign students.

Far right: Oral communication specialist Kay Draper with Da Hai Ding, '83, WPI's first graduate from the People's Republic of China. Right: Dean of Students Bernard Brown.

World House, at the corner of West Street and Institute Road, was established in 1982 as a place where incoming foreign students could stay for a night or two upon their arrival in Worcester. "We didn't want them to be forced into a hotel on their first night in town," says Dean Brown.

The house has evolved into an all-purpose spot for meetings, lectures, parties and other activities. As one foreign student remarked, "You feel like a little grain of sand when you first get here, and World House helps you get through that."

Dean Brown's office also publishes a periodic newsletter, *World House Wireless*, to keep international students abreast of new policies, programs and events. Sprinkled throughout the year are holiday parties, films of special interest and activities coordinated through the International Center of Worcester.

According to Dean Brown, one of his most important, and frustrating, duties as International Student Advisor is dealing with federal regulations. Last summer, the Reagan administration enacted tough new immigration policies designed to keep a closer watch on the nation's 350,000 foreign students. Most changes involve the filing of more paperwork, but, he says, the new regulations have presented WPI with few major problems.

With regard to national student immigration procedures in general, Dean Brown says a tightening was actually long overdue. "It had gotten to the point where the government had no idea who or where some of these students were."

Considering the sheer numbers involved—hundreds of foreign students versus a handful of WPI faculty and staff to deal with them—the foreign student program must be labeled a great success.

Still, it appears that a watershed of sorts has been reached. WPI may well be nearing its limit in terms of the number of students who can be effectively assimilated under the current arrangement.

Dean Brown admits that he doesn't have the time or resources to do all he'd like to for foreign students. Charles Heventhal of the Humanities Department, who coordinates the English as a Second Language program and thus deals with nearly all undergraduate foreign students, is also concerned about strain on the program.

"People are overtaxed, there's no question about it," he says. "But the important thing is that we have a good structure in place and we're building on that structure now. If we're going to get more foreign students, we've got to do it right."

Will there be greater numbers of foreign students at WPI in the future? A look to the past says yes.

Twenty years ago, during the 1963-64 school year, 48 out of 1,315 students were from foreign countries. That's 3.6 percent. A random check of statistics at five-year intervals since then shows a slight increase to 3.8 percent for the 1968-69 school year, followed by jumps to 5.6 percent in 1973-74 and 6.8 percent in 1977-78, culminating with this year's increase to 7.4 percent.

Nationally, however, growth in the numbers of foreign students has stalled. In the 1970s, each new year showed at least a 10 percent jump in foreign student enrollment. Figures from the Institute of International Education show just a 3.3 percent increase in 1982-83. A report issued by the Institute offers these reasons: "Services have suffered, financial aid has been reduced, and requirements for admission have become more difficult to meet." The worldwide economic recession of the early 1980s was also credited with having hurt the foreign student population.

But most of the policy changes that have negatively affected incoming foreign students—tougher admission policies, fewer tuition assistance programs and even some tuition surcharges—apply primarily to public institutions, which enroll 65 percent of the foreign students.

At WPI and other private institutions like it, there is no financial assistance available to foreign students and, at least in theory, admission is based solely upon merit. If anything, places like WPI will be seeking more foreign students.

WPI Director of Admissions Roy Seaberg, '56 ME, says competition for top-flight foreign students will heat up in light of the dismal demographics facing colleges in the coming years. Seaberg this year instituted recruiting trips to South America and Europe.

"In purely practical terms," he says, "qualified foreign students are extremely attractive because they pay full tuition. But a certain balance must be kept. There's a point at which you have too many foreign students, and the Americans begin to feel uncomfortable."

WPI's current blend of foreign and U.S. students, he says, is well within the desired boundaries. "And we have students from all over the globe, not just from a handful of countries. They bring an international outlook to the campus and broaden the perspective of the undergraduates.

"Over the years, we've developed a reputation for accepting quality students from all over the world and treating them well when they arrive. Word about WPI gets back home."

By all indications, word does seem to get back home and, in a couple of cases at least, WPI's reputation has survived more than a few changes of season. Mitsuo Kuwada, a student from Japan who graduated last year with a degree in chemical engineering, is the great-nephew and adopted son of Gompei Kuwada (Class of '93), the official keeper of the original WPI goat. And freshman Jia-He Mei, from Beijing, China, is the grandson of Yi Chi Mei, Class of '14, and the son of Tsu-Yen Mei, '49.

While these examples of tradition may be isolated, it is, in more general terms, a sense of past that makes international students such a valuable asset to WPI.

As a nation, America has a short history when compared with other countries of the world, many of which established themselves thousands of years ago. Students from these foreign lands bring with them a part of their homeland, a part of the past. For some, that past may be troubled, but it is no less valuable for that.

The same sense of past makes a foreign student's vision of the future equally enriching to the American who probes it. Consider Kiet Hoang. The terrible dreams he had about the secret police are behind him. Now he thinks only of the future. As for his career, he's not too interested in management or business. Rather, he plans to use his education to be inventive, to design "helpful things for society." He's also not particularly concerned with money, except for one thing—he does want to help his father.

"Everybody Gets into the Act" at WPI

Not since the 1954 season has WPI been undefeated and untied in football. But in 1983, as the season wound down, the Engineers got wound up, amassing 121 points in their last three games against a combined total of 22 for RPI, Hamilton and Fairleigh Dickinson.

Coming off four consecutive winning seasons, Coach Bob Weiss's 1983 campaign broke the record books wide open: 225 points for the season against opponents' 56; total offense of 3,182 yards—nearly 400 per game!

There were personal records, too. Auburn's Mike Carbone, a junior, set a WPI scoring record with 78 points, and a single-season mark of 1,123 yards gained, breaking the old record by nearly 500 yards! He also racked up a game average of 140 yards. And senior Randy Mocadlo of Vernon, CT, set a single-game rushing record of 239 yards against RPI, scoring two touchdowns en route.

Michael Carroll

WPI Finishes Unbeaten and Untied

The scores: Coast Guard 35–14, Colby 30–7, Lowell 7–0, Fordham 22–6, Bates 10–7, RPI 28–8, Hamilton 42–0, Fairleigh Dickinson 51–14.

Probably the only disappointment of the year came not during the season, but on the day after the final game at Fairleigh Dickinson. Looking for its first-ever NCAA post-season tournament invitation, WPI was denied its bid by the selection committee, shattering the hopes of the entire college, yet failing to dampen completely the results of a sparkling season.

Other records:

- Only undefeated, untied college team in New England.
- Standings in NCAA Division III: First in New England, third in Northeast, ninth in the nation, and placed among the top three teams in rushing offense, rushing defense, and scoring defense.
- Team of the Year and Coach of the Year, in a vote by the New England Football Writers Association.
- Coach of the Year, Boston Gridiron Club.

A BRILLIAN

Michael Carroll

Michael Carroll

Michael Carroll

WPI Finishes with a Flourish

For the Fairleigh Dickinson game, some 400 fans—students, alumni, parents—made the trip to New Jersey, more than tripling the hometown rooters. FD seemed to know what was in store for them—a 51–14 blitzkrieg by the Engineers.

If you were part of the celebration afterwards, you know the thrill and the pride of victory. And you know the closeness of this WPI team—perhaps the greatest ever.

As he boarded the bus for New Jersey with his players, bound for perhaps the biggest game of his life, Bob Weiss was confident. That confidence expressed itself in his feelings for the team, for when someone wished him success, he responded simply, "They'll do it. These guys'll do it. They're that kind of team."

T SEASON!

THE EIGHT-MONTH ENERGIZER

Students are finding great value in getting away from the books for a while—and industry applauds their decision.

By Kenneth McDonnell

Rod MacLellan did it to confirm his career plans. Jeannine Machon wanted to coalesce the bits and pieces she'd learned in class. Diane Peterson put money away for college expenses. And Enis Konuk did it to get a taste of industry.

Whatever their reasons, a growing number of WPI students are opting for extra time in college in exchange for the kinds of experiences only outside employment can provide. It's all part of WPI's Cooperative Education Program (COOP), an eight-year-old arrangement that puts the expertise of undergraduates on the line every day, not in the classroom, but in plants and laboratories of industry and government.

According to Bruce VanAuken, Manager of Systems and Software Engineering at Dennison Manufacturing Corp., COOP benefits employers probably as much as it does students. "We get technically trained though normally inexperienced people through COOP," he says. "They come to us knowing how to do fairly sophisticated work, but they simply haven't had much time to apply what they know. COOP brings all these loose ends together."

Dennison, of Framingham, MA, is a leading manufacturer of pressure-sensitive and metallic labels, thermal transfer products for industry, and other specialty goods. Junior computer science major Jeannine Machon of Randolph, MA, is Dennison's most recent COOP employee. She worked under VanAuken from June 1983 through January 1984, one of two eight-month COOP periods each year. "My programming assignment at Dennison," she says, "was concrete and market-oriented—just what I needed. Now I'm better able to see the practical possibilities of my course work and projects."

Student interest in COOP seems to be based on two, closely related objectives. "WPI is so intensive," says Joanne Shatkin, a junior biology and biotechnology major from Cranston, RI, "that many of us need a break at some point. But we don't want to interrupt our education."

Equally important, say many COOP students, is their desire to get a close-up look at the profession they're studying to enter. For most, COOP is the answer to both concerns.

Joanne's COOP assignment in the Materials Protection and Biotechnical Group of the U.S. Army's Natick (MA) Laboratories fulfilled her personal and career needs. Natick Labs is the R&D branch of the Army that develops and tests the equipment used by the nation's foot soldiers—clothing, field shelter, freeze-dried foods and the like. As a member of a small research team, Joanne designed coatings to protect water purification units adaptable to various combat situations. "I'd gotten so caught up in my college work," she recalls, "that I never had a chance to ask myself what I was actually doing." Her COOP experience, she says, gave a sharper focus to her career plans.

Most COOP students find assignments in Massachusetts, but for those whose COOP experiences take them far beyond

Jeannine Machon, a computer science major, commuted to Framingham: "25 miles and 24 lights."

commuting range of Worcester, finding such necessities as housing becomes one more reminder of how true to life COOP is.

Senior Joan Marler, for example, a materials engineering major from Rochester, NH, was hired by General Electric to perform materials testing and manufacturing engineering at the company's Plainfield, CT, plant. For Joan, COOP was perhaps more full time than for most, since it meant relocating for her eight months away from WPI. But she found housing with an elderly woman not far from GE. "It was just fine," she says now. Socially, she spent time with her GE colleagues during the week; and on many weekends she made the trip back to her Worcester friends and classmates.

At first, she recalls, the pace at GE was slower than she'd expected, but after a short time on the job, more rigorous assignments came her way. "I was treated like a full-time employee," she says. "You learn quickly how to get things done in a corporate setting."

Joan had changed majors just before going on COOP. "My GE work and self-imposed departure from everything familiar gave me a confident sense of my career goals and the world beyond WPI," she says.

"Textbooks," Joan adds, "present the world in two-dimensional terms. But as we all know, the world is three-dimensional. COOP was the smartest decision of my college career."

Bonnie Blanchon, '83 CHE, who now lives in Acton, MA, made perhaps as much of her COOP venture as anyone can expect. Like roughly one-third of all COOP students, Bonnie participated in not one but two COOP periods, first at Procter & Gamble's Cincinnati, OH, plant and later at the Jaffrey, NH, manufacturing facility of Millipore Corp. At P&G, Bonnie was in consumer research, testing products to support advertising claims. And at Millipore she developed synthetic membranes for use primarily by the medical profession.

Upon graduating, Bonnie found that, in job recruiting, COOP had been every bit as important as her degree. She was offered a job and is now working in the membrane engineering section of Millipore's Bedford, MA, facility. "This position ties my work to R&D," she says, "but I also interface with business, a fusion that suits me well." She also likes Millipore's industrial mission. "It rewards effort, it teaches you how to get along with people, and it lets you interact with the 'push' of manufacturing and the theory of R&D."

Bonnie was Millipore's first COOP student assigned to the Jaffrey plant. Says Thomas Lavin, Production Manager of Industrial Products at Jaffrey, "To Millipore—and many other companies, I imagine—COOP is a vital recruiting tool. We can look at potential employees under actual work situations and pressures, and the students can do the same with us—with little down-side risk to anyone."

"WPI COOP students," adds David DeWitt, Millipore's Production Manager of Medical Devices, "seem to want positions where they can go in and 'get their hands dirty.' We're often in a fight-fire situation at Jaffrey, and we need to know how well a young individual can relate to our other 350 people and stand up under pressure from, for instance, an old codger who might say, 'Don't bother me, youngster!'"

In large measure, says Lavin, Millipore's endorsement of the COOP Program is a reflection of Program Director John R. Farley's knack for matching the needs of employers and students. "By visiting our facilities," says Lavin, "John gets to know what we do, how we work and what we expect from our employees."

Currently, says Farley, '68 CHE, some

Martin Hopkins, '83 CE, on the job at Morgan Construction.

Geoffrey Strage

John Farley, '68 CHE, directs the program: "95 percent of our COOP firms employ alumni."

60 students are on COOP assignments. More than 100 are signed up for the upcoming June-January period. Since taking over the program in 1979, he has seen the number of students registered nearly double. At this rate, he adds, the number could double again before 1990.

On the other side of the ledger, about 55 companies, nearly one-third of them outside of Massachusetts, are involved in the program. But, says Farley, corporate commitment is down considerably today, due to the recession of 1982. "With more and more students showing interest," he says, "we're always eager to speak with prospective COOP firms—especially in light of the program's benefits to employers." Alumni, he adds, are represented in about 95 percent of WPI's COOP companies.

According to Farley, 60 percent of COOP students are mechanical or electrical engineering majors, with the balance coming from computer science, chemical and civil engineering, and a few from the sciences.

Few requirements face students interested in COOP. They must be full-time juniors or seniors, maintain satisfactory academic progress and receive approval from their academic advisors. They pay no tuition during their COOP assignment and are compensated by their employers, but academic credit is not given for their efforts.

Like Bonnie Blanchon, Martin Hopkins, '83 CE, of Worcester, took full advantage of his two COOP assignments. Following his sophomore year, he went with Worcester's Riley Stoker Corp. as a programmer in its structural engineering department. He later worked part-time for Riley while back in school.

Today, Martin is assistant to the director of computer integrated manufacturing at Morgan Construction, Worcester, where he spent his second COOP. On assignment in Morgan's manufacturing engineering department, he was able, even as a COOP employee, to cross departmental lines and assume plenty of responsibility.

"That experience was *so* beneficial to my career," he now says. Not only did the giant rolling mills manufacturer hire him ("Actually, my job offers outnumbered the rejections," he says), but he took on more meaningful duties right away than he had ever expected to.

"Whether or not you find a job with your COOP employer," he adds, "your résumé will undoubtedly be stronger for the experience."

One potential dilemma for COOP students is the stipulation that they prolong their academic career. One COOP period of employment means an extra two terms (14 weeks) at WPI to allow students time to complete course work, projects and the Competency Examination. Two COOP periods add a full year.

"It's definitely something to consider," says Joanne Shatkin. But, she contends, "too many students want to rush through college, get that sheepskin and jump into a job. How many understand what they're getting into? And *why*."

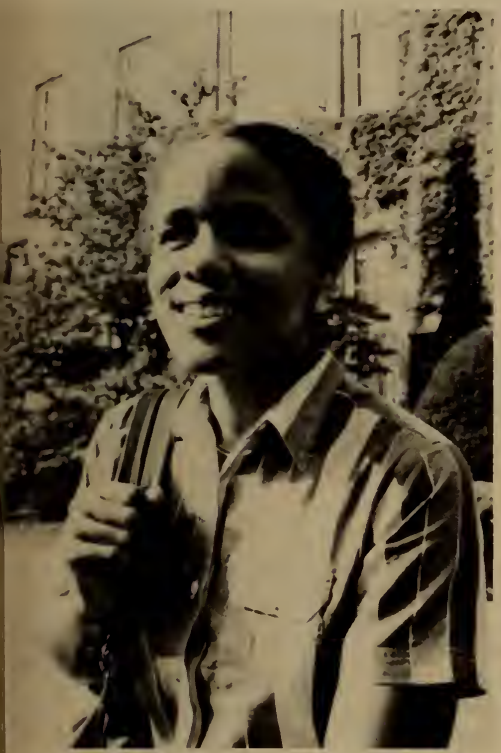
"Take the time," counsels Martin Hopkins. "The dividends will come in more and *better* job offers."

Bonnie Blanchon of Millipore concurs. "Don't be put off by the extra time in college that goes along with COOP. You'll be opening yourself up to new opportunities—both in college and later."

Junior Enis Konuk found the payoff back in the classroom following his COOP. The Turkish electrical engineering major wrote software for control systems at BTU Engineering, Inc., a maker of semiconductors located in Billerica, MA. "COOP is helping me digest the course work I completed before going out. And classes and projects are more relevant."

Richard A. Zeccola of IBM, echoes Enis' viewpoint. Zeccola is Project Manager of Printer Quality and Reliability at IBM's Endicott, NY, facility. He is also a COOP recruiter. IBM, he says, looks to

EE Major Rod MacLellan writing software at Sprague Electric Company.



Sherry Horeanopoulos

For junior Diane Peterson (left), COOP paid off in practical and financial terms. Enis Konuk, '85 EE (above), got a close look at the semiconductor industry.

COOP students for fresh ideas and to question existing company methods. "We've had three WPI COOP students at our Endicott plant," he says, "and we're batting a thousand."

IBM, Zeccolla reports, recruits students who are technically prepared, mature and ready to work on a team. "We find all those qualities in the WPI students we hire, plus the ability to grasp problems and to present themselves professionally." WPI's emphasis on student projects, he believes, is a key source of this capability. "Our biggest problem," he concludes, "is that we can't hire *enough* WPI students."

Diane Peterson's COOP experience challenged and rewarded her in much the same way that it has other students. Last year, as a junior, the Copiague, NY, computer science major designed a mathematical simulation of a military defensive probe being developed at the Westboro, MA, plant of GTE Corp. "It gave me a chance to apply what I'd learned in class—*and* put money in the bank for college."

Rod MacLellan, too, found the financial payoff of COOP especially timely: he was married recently. Rod finished his COOP in January at Sprague Electric Co., a semiconductor manufacturer and major Worcester employer. His assignment there, writing software for monitoring semiconductor wafer processing, will enable him to follow a number of career directions and help him better define his curriculum and project goals back on campus. "It was a great confidence builder," he adds.

Michael Ridinger, Sprague's Manager of Device Development, was Rod's COOP supervisor. "Our COOP students work on current and important programs," he says, "not back-burner projects. They are hired as technicians, but they bring with them an added strength—an engineering approach to problem solving."

Adds Jerry Bouchard, Sprague's Manager of Technical Services, "We look for the kind of people who want to work at Sprague. We look for character, not just technical skills."

Today, about 1,000 colleges and universities offer some form of cooperative education. Most are a curriculum option, but some are mandatory and built into the institution's overall educational program.

Both systems, of course, have their advocates. Thus, we can ask whether WPI's COOP program—which is strictly by choice—should be more regimented. Should it be mandatory?

Without exception, those interviewed for this story—students and employers alike—responded to this question with a resounding NO. But at the same time, most students heartily recommend COOP to their classmates, and employers regard COOP as vital to their long-term recruiting and everyday operations.

"We look for students who *want* the COOP experience," says Millipore's Tom Lavin, "not those who have no choice."

Off and Running

In a moving tribute, WPI inducts eight of its greatest sportsmen into the new Athletic Hall of Fame.

In his time, the late Harry L. Dadmun, Class of 1891, "Worcester's Fastest Human," was a world-class runner. He won the 1891 National AAU 1/2-mile Championship with a time of 1:59.2, a WPI record that stood for 60 years. He also won the French National Championship and dominated WPI opponents in every race from 100 yards to the 1/2-mile and the hurdles.

Dadmun and seven others were inducted, as charter members, into WPI's Athletic Hall of Fame. The induction came at a dinner ceremony attended by more than 200 at Homecoming Weekend in October.

Six alumni, a coach and a former athletic director constitute the membership of the Hall of Fame, an idea conceived a decade ago to honor the extraordinary athletic contributions made during WPI's more than 100 years of intercollegiate athletic competition.

Said Ted Coghlin, '56, who, with track coach Merl Norcross, co-chaired the organizing committee, "The dedicated efforts of POLY CLUB members, the Athletic Department, the Class of 1959 and many other volunteers gave life to this long-overdue concept. It's been a team effort all-around."

Dadmun's fellow inaugural members are Thomas W. Berry, '24; Albert J. Raslavsky, '39; Raymond J. Forkey, '40; Henry W. Nowick, '56; Edward F. Cannon, '68; Robert W. Pritchard, former athletic director and football coach; and Charles R. McNulty, a WPI coach for 37 years.

"Selection of members," said Norcross, "is based on their athletic ability, integrity, sportsmanship and character, with special emphasis on their athletic contributions to their WPI teams." In addition, membership may be offered to non-athletes who have provided distinguished service to WPI sports—for example, coaches, faculty and other alumni. Any member of the WPI community, past or present, may nominate candidates. Induction of additional members is planned on an annual basis.

Thomas W. Berry, '24, earned two letters in football and three in baseball, but is better known for his exploits on the basketball court. He was a two-time All-New England center when the Engineers were New England champions in the 1919–20 and 1920–21 seasons. He played all but two minutes of the team's games in his last three years. He died in 1959.

Albert J. Raslavsky, '39, was also a three-sport man. He played end in the Engineer's first undefeated football season of 1938. In basketball he captained the team and made All-New England in his senior year. That season WPI went 13–3 and was ranked in the Top 10 in the region. He earned four baseball letters, serving as captain in his senior year. As a sophomore, he received offers from the Pittsburgh Pirates and the Detroit Tigers to play professionally. He is currently a plant superintendent at H. H. Brown Shoe Company in Worcester.

Raymond J. Forkey, '40, combined with Raslavsky to give WPI some of its best football, basketball and baseball teams. He is the only WPI athlete to earn 12 letters.

Forkey captained the football team in his senior year and at quarterback was a pivotal force on the 1938 undefeated team. In basketball he helped the Engineers compile a four-year 47–17 record, including the 13–3 team of 1938–39. He also captained the baseball team. Forkey is still an avid golfer and has done well in many local tournaments. Currently a WPI Trustee, he is the retired president of Coppus Engineering of Worcester.

Henry ("Hank") Nowick, '56, was another three-sport standout. In football he led the Engineers to their undefeated 1954 season. That year he was named to the *Chemical Engineering News* All-America team. In basketball he captained the team in his senior season and established a single-game scoring record with 33 points. He was also the leading pitcher on the baseball team, compiling a 10–2 record in four years. He is currently a senior engineering specialist for Monsanto Corp., in Indian Orchard, MA.

Dadmun, '91

Berry, '24

Raslavsky, '39

Forkey, '40

Two-time All America soccer star Edward F. Cannon, '68 CE MNS, at the Hall of Fame induction ceremonies. Offering congratulations, from left to right, are Peter Horstmann, '55 ME, Mark Mandel, Sports Information Director, and Alfred E. Barry, '57 ME.

Edward F. Cannon, '68, is currently assistant athletic director, a physics lecturer and the highly successful soccer coach at St. Anselm's College. At WPI he earned All-America soccer honors in 1967 and '68, when just 33 players in the nation, regardless of division, received that distinction. During his career at WPI the soccer team twice played in the NCAA Regional Tournament. He was also an excellent basketball player and was selected to the Worcester Holiday Tournament all-star team in the 1967–68 season; WPI beat Assumption and went on to win the tournament.

Robert W. Pritchard's name was synonymous with WPI athletics for 31 years. He was the school's athletic director from 1952–78 and head football coach from 1947–66. Under his leadership WPI's athletic program flourished. Among his most noteworthy accomplishments: his 1954 undefeated football team, which earned him a National Coach of the Year nomination; his role in the planning of Harrington Auditorium; his induction into the National Association of Collegiate Directors of Athletics Hall of Fame; his role as founder of the NCAA's Drug Education Committee; and his ECAC James Lynah Award, for his contributions in intercollegiate athletics. He passed away in 1978.

Charles R. McNulty, who serves as WPI's coordinator of athletics and scheduling director, has been a coaching mainstay at the school for more than 37 years. He coached football from 1945–81, was head basketball coach from 1947–66 and was head baseball coach from 1946 until he relinquished the position last year. His other honors include the 1981 Jack Butterfield Award, for his devotion to the improvement of college baseball; and his 1968 award for "Contribution to Basketball," presented by the Worcester County Basketball Coaches, Sportswriters and Sportscasters Association, an organization that he helped create.

Nowick, '56

Cannon, '68

Pritchard

McNulty

A SHOT IN THE DARK

Sherry Horcanopulos

Larry Katzman and Marshall Levine: Putting a lid on home heating costs.

The scene is a common one: an engineer buried in a foot-high stack of technical reports on some sliver of an esoteric field of interest. And not surprisingly, he's never heard of the author, in this case a Lawrence Katzman of the Boston area.

The reader is Marshall Levine, '55 ME, of Wayne, PA. It's the late 1970s. He's reading everything the National Bureau of Standards (NBS) can unearth for him on the subject of energy conservation in residential buildings.

Levine's interest in all this is honest enough. His career has been distinctive, working at the time under contract to the Commonwealth of Pennsylvania, examining how fuel oil dealers can best benefit from the developing market for home heating retrofit and replacement equipment.

He'd done computer modeling of retrofit strategies and payback potential to forecast homeowner response. He'd served on the Governor's Energy Council and was chairman of the Philadelphia Residential Energy Task Force. All this during the highly charged era of OPEC scares and skyrocketing energy costs. And earlier, he'd developed highly sophisticated blood analysis technologies for the medical profession.

"The elegance and excitement of high technology," he now says, "was intoxicating, but often it seemed to serve relatively few people directly."

Sensing a need both to solve people's everyday problems and to apply his expertise, he and a clergy friend formed in 1979 the Institute for Human Development (IHD), a nonprofit community service group based in inner-city Philadelphia. IHD's Burner Bank furnace reconditioning center employed more than 100 local residents. Several other states are now following the IHD lead.

"Lots of gadgets were appearing on the market about then, boasting of energy savings far in excess of what logic would tell you." Besides, he says, lots of government fuel subsidy dollars were going up the chimney through the decaying, inefficient furnaces of the neighborhoods. "The Burner Bank created warmth two ways—by employing people and by heating their homes for less."

Enter Larry Katzman. The reports Levine had poured over at NBS were the result of a four-year study Katzman had done of residential oil-fired heating system performance. And at Walden Research of Wilmington, MA, he'd developed standardized NBS tests for comparing the performance of competing furnaces.

Levine's reading told him right away that Katzman was the only real authority he'd found on the subject of home energy conservation. He had to meet this Larry Katzman.

"Marshall called me in late 1979," Katzman recalls. "He was the only person who'd ever contacted me about my work."

The rest of the story reads like an entrepreneurial *Who's Who*. Their combined experience and interest in energy issues and desire to form a small, private firm quickly led to formation of Thermal Data Corp. Combining their modeling, computer and marketing skills, they developed the Residential Energy Computer (REC), a self-contained sales tool designed to promote residential energy conservation with a structured, unbiased presentation.

In just 15 months, their initial $4,000 investment jumped to sales in excess of $1 million. Today, more than 1,200 units are in use by heating contractors, fuel suppliers and energy consultants coast to coast. The unit is carried in an attaché case by a salesperson and is programmed to show dollar savings and paybacks for a variety of heating alternatives, retrofits and upgradings.

"The REC is simple, it builds a low-cost econometric model, it answers the questions of the homeowner in just a few minutes—and it's ethical," says Katzman.

Adds Levine, "Marketing has always been a problem for contractors and tradesmen. REC is the catalyst for sparking the gap between product and market."

And, oh yes, to complete the story—only after a few of their earliest conversations did Levine and Katzman discover that they are *both* WPI graduates. A CHE major, Katzman graduated in 1963.

But that's not all. Hard as it may be to believe, both were active brothers in the same WPI fraternity—AEπ!

Says Levine, "There was instantly a trust between us, a mutual recognition of capability and judgment that WPI had helped mold."

Sometimes a shot in the dark turns out that way.

MBTI IN THE WORKPLACE

Type theory defines personality as the way you prefer to see and react to the world. Does that affect the way you work? Common sense—and the theory—say yes.

By Mary Ruth Yoe

Personality's role in the work-place is easy to acknowledge, hard to quantify. The successful librarian has one type of personality, most people would agree; the successful car salesperson another. Therefore, shouldn't it be possible to use a personality test to match job with applicant?

Such tests are available, yet few businesses use them in hiring. "Their degree of job-related validity is not high," argues Mary L. Tenopyr, division manager for resources and systems at American Telephone and Telegraph, "so they aren't used." Furthermore, the Equal Employment Opportunity Commission supports strict regulations, trying to ensure that screening tests are valid and do not discriminate against minorities. Employers, in turn, shy away from using personality inventories in hiring—avoiding both expensive validation studies and possible lawsuits.

Once people are hired and in the work-place, however, personality's effect on performance can be examined. Larger organizations, those offering their employees in-house career development counseling, often use personality tests in team building or as an advancement tool, especially for managers. "An ideal manager, if there is such a thing," says Thomas Stutzman, a professor in the School of Management at Rensselaer Polytechnic Institute, "has the perceptual skills to recognize the variables in people and in the environment and to vary his or her style accordingly."

Contemporary theory of management styles, adds John Clemens, a former marketing executive for the Pillsbury Company who is now an associate professor of management at Hartwick College, "defines management as accomplishing something through others. That means a leader must command a whole range of leadership styles, from wholly democratic through dictatorial.

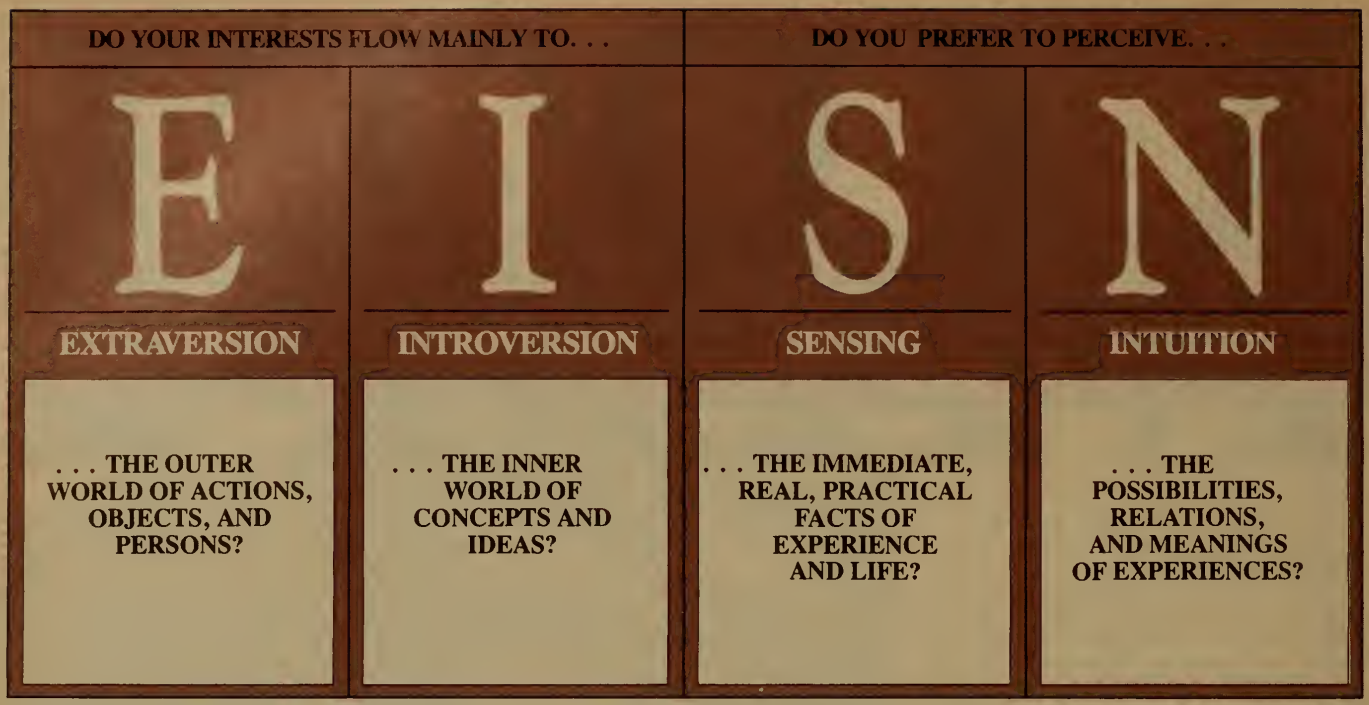
"There are, of course, real problems with being a chameleon," Clemens continues. "Personality is a given. It is possible to make small, 2 or 3 degree navigational changes, but not to change course entirely." Still, modern management places a premium on interpersonal skills—and on such navigational changes.

Enter a little-known personality inventory with a loyal band of enthusiasts: the Myers-Briggs Type Indicator (MBTI), based on the work of two women, Katharine C. Briggs and her daughter, Isabel Briggs Myers. About the time of World War I, Katharine Briggs began to study the similarities and differences in human personalities. Then in 1923, she learned from reading the English translation of Carl Jung's *Psychological Types* that her scheme of personality, developed independently, was similar to Jung's.

Everyone intrinsically prefers a certain way of perceiving and judging the surrounding world: that is the basis of Jung's typology. His typology heavily influenced Katharine Briggs's own work, an influence that went against the academic grain. (While both women were well educated—the daughter graduating from Swarthmore at age 16—neither had done graduate work in psychology.)

"Although Freud and Jung were both given honorary degrees by Clark University before World War I," says O.W. Lacy, a clinical psychologist who is chief of career planning, testing, and placement at Franklin and Marshall College, "the science of individual differences as it grew up in America remained largely empirical as opposed to psychodynamic in theory, at least through World War II." Lacy pauses, then confesses:

"Jung was a pariah in academic circles. I used to read Jung as if he were Henry Miller." Even when psychodynamic theory crept into U.S. graduate schools, "the overwhelming training and emphasis was Freudian." Many people, Lacy explains, had diffi-



culty with some Jungian ideas, including his theory of a collective unconscious. The result was "a general ignorance about Jung."

In 1942 Isabel Myers, who had caught her mother's enthusiasm for a theory of types, began work on a research tool to indicate personality preferences or types. She would try out her questionnaire on family and friends, then revise it and try again. "Isabel Myers was working independently of an academic career track," notes Lacy. "She did have a marvelous old-boy network because her father had been director of the National Bureau of Standards, and he had some clout." Through her father, for example, Myers convinced a medical school dean to let her test his students, a study that expanded to produce MBTI results for more than 5,000 medical students and 10,000 nurses.

Henry Chauncey, then head of Educational Testing Service, learned about the indicator and proposed that ETS buy and distribute Myers's test for research purposes. But not everyone at ETS was as impressed with Myers's work as Chauncey, and although ETS published Isabel Myers's MBTI manual in 1962, the inventory was effectively buried there.

Then in 1975, distribution rights were transferred to Consulting Psychologists Press—which sold a million copies within two years—and the Center for Applications of Psychological Type was organized to coordinate MBTI research. Today the national association of MBTI users has 1,900 members, including college and university researchers in personality, career counselors, therapists, and a sizable number of management consultants.

President of the Northeast Association for Psychological Type, SueLynn (her whole name) is also a consultant in organizational and management development at the Johns Hopkins Hospital. On a bright early-winter afternoon, she meets with four mid- and upper-level hospital managers. The four have already completed the 166-question indicator (a paper-and-pencil, multiple-choice inventory), and SueLynn will soon hand back the results—"an identification, not a measurement, of personality"—but first she explains the theory of types.

"Humans have two basic mental processes," she begins, "perception, or perceiving information, and judging, or coming to a conclusion about the information gathered." She pauses. "Take a minute and write your name using the hand you ordinarily don't use." The four obey. The resulting signature, of course, is both harder to pen and harder to decipher. "Just as you've been born with a preference for handedness, you have an inborn preference for the way you perceive the world." Still, everyone *can* write with the unfavored hand; in the same way, type preferences indicate areas of strength and areas for growth. With that point established, SueLynn begins.

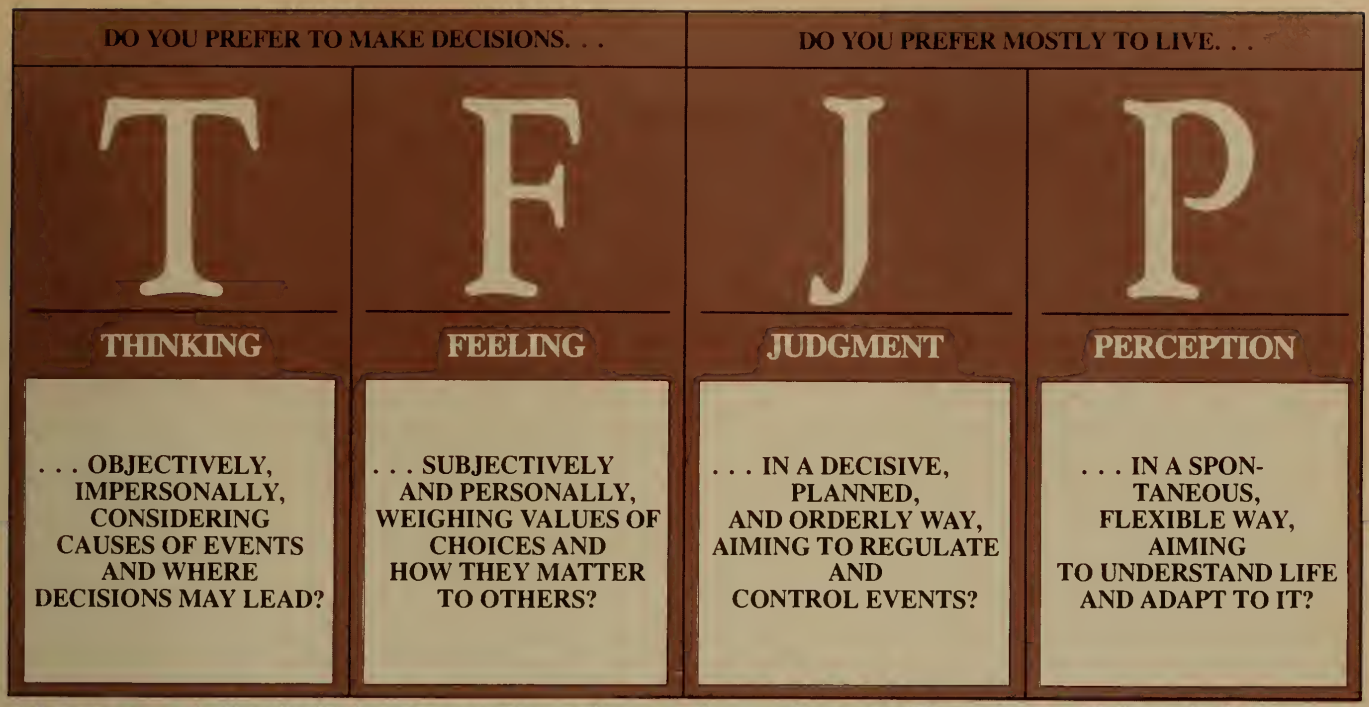
Sensing (S) types gather information by using their five senses. They pay attention to facts, details, rules, and regulations. They are practical, down-to-earth, "reality-based." Firmly grounded in the here and now, S types talk about the past and the present; their future is short-term, six months to two years ahead. They learn best in 1-2-3 steps, and they base their decisions on experience. Of the general population, about 75 percent are thought to be sensors.

Intuitives (N) types, on the other hand, use facts as a jumping-off point into possibilities, options, alternatives. "They're always making connections," says SueLynn. Intuitives speak in generalities, are most concerned with concepts, theories, world views. Although intuitives are good problem solvers, even after the problem is solved they continue to proffer new solutions. N types are always looking to the future, and they learn the concept first, then support it with facts.

"What does this mean in a work situation?" SueLynn asks her audience. Several things. For one, an S feels most comfortable with a project when it is immediately applicable, obviously useful, while Ns more easily take on long-term tasks. These preferences also influence the way people give directions. "The N will say, 'Send a letter to Ms. Jones about our meeting,' " explains SueLynn. "The S will respond, 'But what do I say?' The S wants directions, examples, specifics, models.

"On the other hand, an S manager will say, 'I want you to do this project, and here's how I want you to do it' and will go on to list step-by-step instructions. The N he's instructing will say, 'Why does S want *me* to do it? He's got it figured out already.' " Nods of recognition all around the table.

"The next two types have to do with judgment," SueLynn continues, "or how a person comes to a conclusion." The thinking (T) types base their conclusions on logic and analysis. Their



style is impersonal—they don't take into account how a decision will affect other people. What they do require of a decision is that it "make sense." They are sure of their reasons for a particular course of action, and they expect that others can justify their decisions in the same way.

Feeling (F) types do *not* base their decisions purely on emotions, as the name seems to imply. Rather, they are also concerned with attitudes, beliefs, values, morals, and convictions. In making a decision, they worry about its effect on other people, and they tend to value harmony and avoid conflicts. Unlike Ts, feeling types often cannot give "reasons why" they have made a decision.

The decision-making preference is apparently the only one with a sex bias. Although 50 percent of the general population are thinkers and 50 percent feelers, men account for at least 60 percent of the thinkers, while women make up at least 60 percent of the feeling type. (This fact may testify to the influence that environment can have on type, or it may point to an inherent sex difference.)

On the job, Ts expect to be recognized for their competence; they find a raise, a change in title, or a bigger desk more meaningful than a verbal thank-you. But Fs want to be appreciated for "who they are, doing a job." With Fs, says SueLynn, "a manager should use the words 'special' and 'unique' and 'thank you,' and should use them often." In large organizations, these differences can be the root of morale problems, "because in most administrations, the top managers turn out to be Ts. They are, of course, very satisfied, because they're getting all kinds of T rewards—responsibility, big salaries, good titles.

"At the middle-management level, there are both Ts and Fs. The Ts at mid-level are more dissatisfied, because fewer T rewards are available, while the Fs are dissatisfied because the Ts at the top treat them like functions, not people—a T thinks that if you haven't been fired, you should know you're doing a good job." SueLynn's audience chuckles.

The bottom level of a bureaucracy, she continues, is typically filled with secretaries and clerks, usually women and therefore most likely to be Fs. "They are very dissatisfied because they're thought of as machines. Even Ts at the bottom are dissatisfied because there are no T rewards except their paychecks."

Whether sensing or intuitive, everyone has a preferred way of perceiving; likewise, whether a thinking or feeling type, everyone also has a favored style of decision-making. Some people favor information-gathering over decision-making, and vice versa. According to type theory, the favored activity will be used most often in dealing with other people.

A preference for judging (J) characterizes about 50 percent of the population. Whether a thinking or feeling type, a J enjoys completion. Words associated with this type include: "wrap up, finish everything, no loose ends, organize." They make lists, have plans, live life with a calendar. Again, nods of recognition from the four managers as SueLynn speaks. "They have a need to be productive in order to feel good about themselves." As people who like to be in control, Js decide, then act. They are uncomfortable with sudden upheavals, and must plan for change. Therefore a manager should give them time to think about changes. "In other words," she jokes, "don't tell them on Friday afternoon that the office is going to be relocated on Monday."

The other 50 percent prefer information-gathering to decision-making. These perceiving (P) types, says SueLynn, "are often accused—most often by Js—of not being able to make a decision. They don't *want* to make a decision." Ps keep options open. They enjoy seeing the other side, getting new information. Although their upsetting habit of questioning conventional wisdom often pushes them to the far side of a bureaucratic organization, Ps come into their own in diagnosing and managing a crisis. Compared to Js, perceptive types seem more spontaneous, more flexible, more adaptable. (An aside: Of all the types, SueLynn adds, Ps "have the most highly adaptive behavior—after all, they have to make some decisions, in order to get through school and in order to be paid.")

The fourth and final preference expresses an individual's world attitude. Extroverting (E) types prefer to relate to the outer world of people and things—not because they like people more than their introverting (I) counterparts, SueLynn cautions, but "because they need to talk to understand. They are energized by being with people." E types make up about 75 percent of the population. Introverting (I) types, in contrast, are energized by

being alone. They relate most easily to an inner world of self and ideas; "they go inside to think." Articulate, they usually think before they speak. (Again, some adaptation is obviously required on the part of I types.)

Now SueLynn is ready to show the four managers how to interpret their inventory results. Each person, she explains, has a preference for E or I, S or N, T or F, and J or P—in other words, each person will fall into one of 16 four-letter categories, such as ESTJ or INTP. But that isn't the whole story. Each of those four preferences falls along a scale from 0 to 60; 0 is the dividing line between a preference and its opposite, and thus scores between 0 and 15 mean that a person may actually shift back and forth between two opposing types.

"So we should try to categorize people and treat them accordingly?" asks one of SueLynn's listeners. "Well, yes and no," she replies. At this point, the tendency is to categorize. Researchers have found that certain MBTI types seem to flock to certain professions.

When *Dragnet's* Sgt. Joe Friday pressed for "the facts, ma'am, just the facts," he was being true to type. STs, who have what SueLynn calls "a very firm personality," are often police officers or members of the military. SFs, "who pay attention to facts, yet are people oriented," make good social workers, caretakers, nurses, ministers, psychologists (not psychiatrists, who are often NFs), and physicians noted for their bedside manner. NTs, who "gather information and then apply logic to the possibilities," are especially good at research, particularly in quantitative fields, and at dealing with organizations. NFs, "the most articulate of all the types," are often journalists or novelists, counselors or psychotherapists.

Business administrators—leaders in industry, government, and the military—are often TJs. The two types most attracted to the sciences are INTJs and INTPs, people who seem to value knowledge for its own sake. And studies of extremely creative people—Nobel laureates, etc.—have found that creative people tend to be Ns: by intuition, they are able to see around the corner.

Still, categorization is exactly what Jung feared: in letters to Katharine Briggs and Isabel Myers, he wrote that he did not want the type scales to be used as labels. "Each type serves as a resource to the other," notes SueLynn. "It is extremely important that people do not use type to stereotype or pigeonhole—in the work-place or anywhere. A perceptive type *can* get the job done, a sensor *can* have a plan for the future. To stereotype is to rob a person of his or her opportunity to develop, to change."

"Type is just one of the many markers—age, sex, ethnic and religious background, even geography—that help us predict other people's behavior," says O.W. Lacy. "One's appropriate type is not a cell from which there is no escape, but a home ground from which one can venture forth to live life more fully. Unfortunately, there is much in what we do with type that reminds people of the horoscope, and that is a constant danger."

To help remove the Myers-Briggs Type Indicator from the realm of the horoscope, Lacy has spent much of the past decade in research "aimed at establishing the validity of the concept and the instrument." In each of the past eight years, about 500 of Franklin and Marshall's entering freshmen have been given the MBTI and two more established inventories, the Strong Campbell Interest Inventory and the Omnibus Personality Inventory. The results are used in academic, career, and personal counseling while the students are at F&M, and the information also adds to Lacy's research. An analysis of results from some 3,500 students is under way with a colleague at the University of California-Berkeley. "How the results of the MBTI correlate with the results from the other inventories will provide concurrent validity evidence." Isabel Myers performed similar validity tests, but Lacy points out that he hopes "not only to replicate, but also to extend her results, with a different set of students, from different decades and different backgrounds.

"Knowing what a person's type is," Lacy asks, "can we predict what a person will do later?" To find out, Paul Leavenworth, formerly assistant dean of students at F&M and now a PhD candidate at William and Mary, will test some aspects of the MBTI's predictive validity. Using F&M data, he'll attempt to correlate a student's type upon entering college with college leadership activities later. "For example, students who make Phi Beta Kappa tend to be intuitives—tend in fact to be IN-Js," Lacy notes. "The J probably gives them the organization necessary for consistently realizing really good grades.

"Isabel Myers felt that the educational system begins to screen for type, and indeed it seems that sensing types and perceiving types tend to drop out a little bit as you go higher up the education ladder." (The inference is that intuitive types, who find it easier to grasp concepts, and judging types, with their liking for completed projects, fit most neatly into the educational system.)

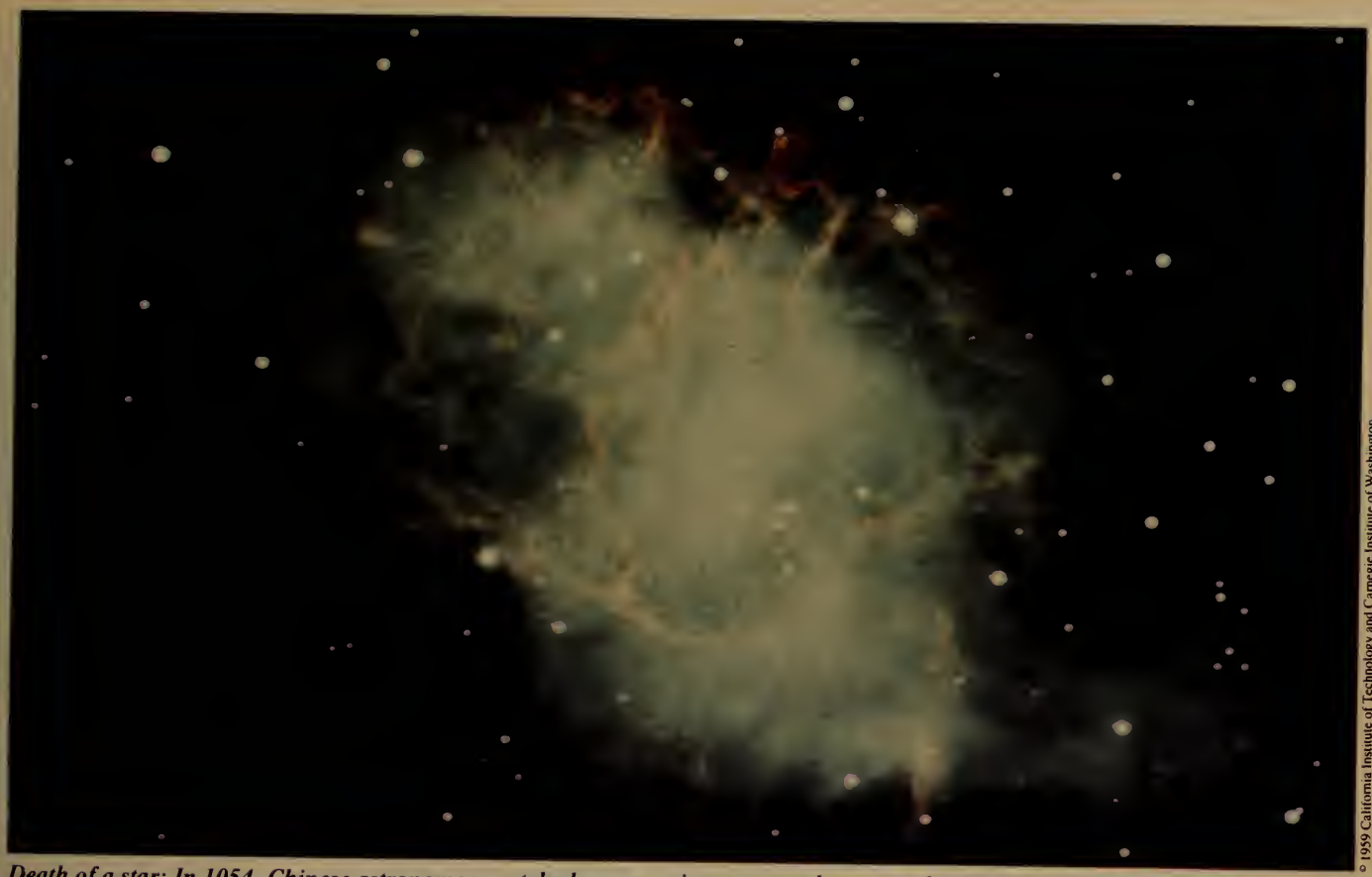
Another question worth asking is whether, compared to their numbers in the general population, certain types engage in certain activities in disproportionate numbers. Himself a 2,000-miler on the Appalachian Trail, Lacy has so far studied 96 men and 27 women who have also completed the trail. "The 2,000-miler is typically an introvert and more likely to be intuitive." INFPs, for example, make up about 10 percent of the hikers sample, yet account for only 2.5 percent of the general population. And although 11.2 percent of men and 16.9 percent of women in the general population are ESFPs, "not a single ESFP has surfaced as a 2,000-miler so far."

Meanwhile, research on Myers-Briggs in business and industrial situations is flourishing, with work ranging from how business people conceptualize to studies of different professions, such as banking and accounting, and the types they seem to attract. "There's one problem," admits Mary McCaulley, a University of Florida psychologist who is president of the Center for Applications of Psychological Type. "In business, you get so many judging and thinking types that it's hard to have a significant representation of feeling and intuitive types in your sample."

McCaulley, a consultant for the career-development programs of such corporations as Citibank and Honeywell, thinks that MBTI will become more and more important in the work-place, "especially in companies large enough to have in-house career development programs—quite often the MBTI is used as part of that program." And organizational consultants, she says, keep adding the instrument to their kit of management remedies.

To gauge the impact of types on a team of eight people, say, a consultant might help a manager divide the group members into intuiting and sensing, introverting and extroverting. "In a 12-person office that complained of communications problems," SueLynn says, "I discovered that 10 of the 12 people were introverting types. They simply had no inherent need to let the other people in the office know what they were doing." The solution: the introverting types made an effort to be more communicative about business matters.

Employees exposed to the Myers-Briggs Type Indicator in the work-place often take it home at the end of the day: "The MBTI has wider uses than many instruments," says Mary McCaulley, "because it concerns how you take in information and make decisions—in other words, everything you do."



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Death of a star: In 1054, Chinese astronomers watched as a massive star, now known as the Crab Nebula, exploded. Space Telescope should let today's astronomers witness another exploding supernova—but in more detail.

ON THE OTHER SIDE OF THE ATMOSPHERE

...Space Telescope will see the universe with 100 times more detail than ever before.

By Ann Finkbeiner

The heavens are filled with strangeness. Clouds of stuff as common as dust and hydrogen gas can thicken, condense, and heat until they create stars, but no one knows exactly how. Pulsars are unbelievably dense stars that spin at a quarter the speed of light. Quasars are ancient objects the size of stars, yet shine more intensely than the largest galaxy.

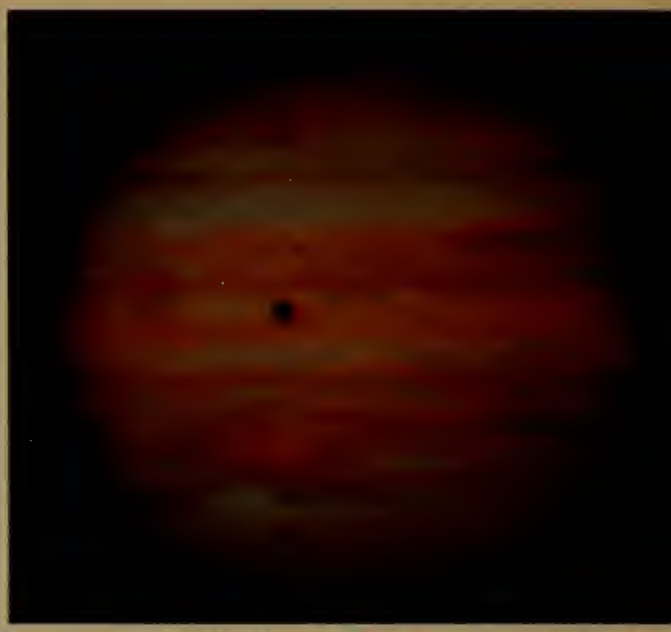
Astronomers have long lists of items to investigate; light alone carries the answers. Unfortunately, Earth's atmosphere—a fabric of cells of differing densities, which bounce, dim, and diffract the light—intervenes before the light reaches us here on Earth. That's why stars appear to twinkle.

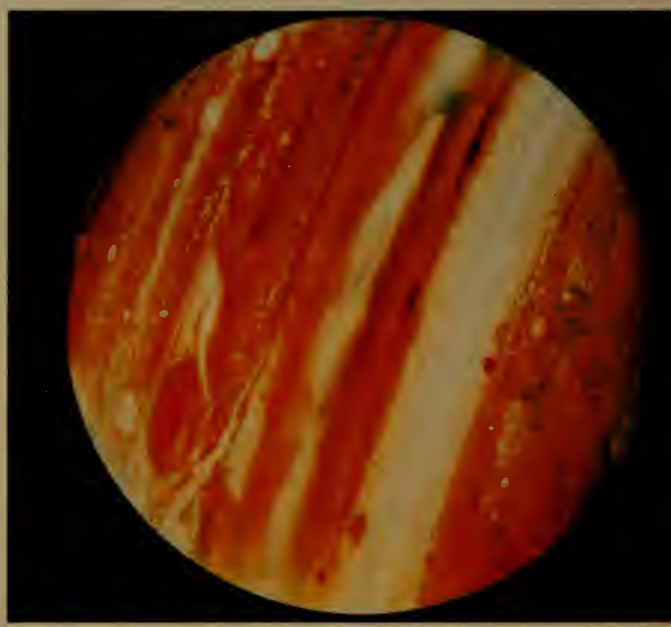
The obvious solution to this interference: put a telescope above the atmosphere. In mid-1986 NASA will do just that, using the Space Shuttle to carry Space Telescope 320 miles above the Earth. Designed as the first permanent observatory in space, Space Telescope should spend the next 15 or 20 years gathering information from the light of stars and galaxies and sending it back to computers at the Space Telescope Science Institute in Baltimore. (The Institute, operated for NASA and the European Space

Agency by the 17-member Association of Universities for Research in Astronomy, Inc., is on the Homewood campus of Johns Hopkins University.) There, after the signals have been transformed and analyzed, Institute staff and guest observers will see the universe on the other side of the atmosphere.

Although its 2.4-meter mirror is not especially large, Space Telescope's power and precision are remarkable: compared to Earth-based telescopes, it will be able to see stars fifty times fainter with a hundred times more detail. While Earth-based telescopes have a limit of resolution (the smallest width that can be brought into focus) of around one arc second, Space Telescope's Fine Guidance Sensors can aim with an accuracy of .007 arc seconds. From Baltimore, that's like being able to pick out a dime in Chicago. Seeing farther out into space, of course, means seeing further into time, and Space Telescope will be able to see 98 percent of the way back to time's beginning.

In addition to the Fine Guidance Sensors, Space Telescope will carry five instruments: two cameras, two spectrographs, and one photometer. They balance each other's talents: where one can provide a wide field of view, another has the resolution necessary for detail. Astronomers will use sometimes one instrument, sometimes several, to satisfy their curiosity about the planets, stars, galaxies, clusters, and the fate of the universe.





The great red spot in Jupiter's atmosphere is hardly visible in this ground-based photo (top). Voyager saw the planet more clearly (middle) and was able to focus quite closely on its turbulent spot (bottom). What the satellite saw from its flight past the planet, Space Telescope will be able to see from orbit around the Earth—and it can watch long enough to observe changes.

Planets

Oddly enough, astronomers know less about the history of our planetary system than they do about that of distant stars. So it is still a puzzle why the planetary atmospheres are so different. "Venus is hot, cloudy, and inhospitable," says Richard Griffiths, an instrument scientist for the Wide Field/Planetary Camera. "Mars is dry, dusty, not much water vapor," he continues. "Jupiter and Saturn are totally inhospitable—even if you got through their

atmospheres, you'd be crushed by gravity before your feet touched anything solid."

Spacecraft would have to actually land on the planets to unravel these puzzles, but Space Telescope will answer some questions. Take the great red spot in the atmosphere on Jupiter, for instance. It has been known for a couple of centuries, says Griffiths, "and we still haven't figured out what it is." One of the most important things the Wide Field/Planetary Camera can do, he points out, is monitor changes on the planets over long time scales. "We should be able to watch the great red spot grow, or watch a storm on Mars build up and die away, or watch the dust move around in Mars's atmosphere." Then, he hopes, more will be known about the physics of planetary atmospheres.

The Wide Field/Planetary Camera, actually two cameras in one instrument, should provide information about the planets themselves, as well. Its special infrared and ultraviolet sensors will detect up to 80 percent of the light that's there. (The best photographic plate on the ground detects 1 percent.) The sensors are essentially light-counters; they will yield images in shades of bright and dark, something like regular photographs.

A spectrograph, by contrast, does not produce an image of the source it's looking at. Dennis Ebbets, instrument scientist for the High Resolution Spectrograph, says the spectrograph will use the telescope basically as a light bucket, to collect a lot of photons. "Then it spreads the light out into a spectrum according to wavelength, the way a prism does." Knowing the spectrum of an object lets an astronomer read its temperature, chemical composition, magnetic field strength, density, rate of rotation, and motion along the line of sight.

"The High Resolution Spectrograph, working with the Planetary Camera, can do 'weather reports' on Jupiter on a day to day basis," says Ebbets. "It can study Jupiter's northern lights. It can analyze the fumes from individual volcanoes on Jupiter's moon, Io. Earth is only one example of a planetary atmosphere. The bigger question is, what are planetary atmospheres like in general?"

"Knowing what planetary atmospheres are like in general," says Richard Griffiths, "will help us understand how frequent or even likely is a planet like Earth."

"I don't think we're alone in the universe," says Duccio Macchetto, head of the Institute's Instrument Support Branch, and an instrument scientist for the Faint Object Camera. "But so far, no one has actually seen another planet outside our solar system."

The Wide Field/Planetary Camera will also be used in the search for planets around nearby stars. Many other stars, Barnard's star being the most famous, have wobbles in their orbits that might indicate planets. True, the Planetary Camera could only detect wobbles caused by large planets like Jupiter; in our solar system, at any rate, life on such giant outer planets is impossible. "But if the model for the formation of our solar system holds for others," says Richard Griffiths, "then where there are large planets, there will also be small ones."

"Whether we can make these observations is marginal," says Macchetto. "But we think the planets should be out there." Macchetto admits that, from a purely physics viewpoint, the discovery wouldn't be earth-shaking. But, he adds, "It'd give us a good, warm feeling, wouldn't it?"

Stars

Astronomers know that huge, hot, young stars often group in the spiral arms of galaxies, and that the groups frequently coincide with dense clouds of hydrogen and carbon monoxide molecules. They think the stars are born there, in nests formed by the molecular clouds.

Clouds of molecules, the theory goes, attract one another gravitationally, condense, and finally become compact enough that thermonuclear fusion begins. The star then catches fire in a wash of ultraviolet radiation. But this is speculation so far, because the molecular clouds absorb the ultraviolet and thus shield the birth process from view. Astronomers pick up only the radio and infrared radiation from the clouds. But the Faint Object Camera should be able to detect some remnants of ultraviolet radiation from a newly born star. And by making observations over three years, astronomers should be able to use the Wide Field/Planetary Camera to watch matter condensing into a star.

Once the star is born and is burning normally, astronomers can predict its probable life history. No matter where they look, a star is going through one stage or another, so prediction is just a matter of statistics. Our sun, for example, should shine fairly steadily for another 4 1/2 billion years. When it finally dies, it will die in two stages: as a red giant, it will expand enough to engulf Earth's orbit; then it will shrink into a cold white dwarf.

Stars larger than the sun die less quietly. After a series of wild fluctuations, they become supernovas and explode. We see remnants of the explosion, hanging in veils and filaments of dust and gas. Using the Faint Object Camera, astronomers will search out a supernova soon after it explodes. If they watch long enough, perhaps 10 years, they can assemble a slow-motion movie of the supernova's expansion into space.

Or rather, they can watch the expansion of part of the supernova. For when one explodes, most of its mass falls back in toward its center. Since there is now no countering, outward push of nuclear burning, gravity's inward pull is fierce. The star contracts so far that electrons are pulled into their nuclei, changing the protons into neutrons. The resulting neutron star, having about the mass of the sun in a 10-mile diameter, is so dense that a spoonful would sink into the Earth's center.

"The magnetic field of a neutron star is very, very, very strong," says Richard White, instrument scientist for the High Speed Photometer, the telescope's simplest instrument. It counts the number of pho-

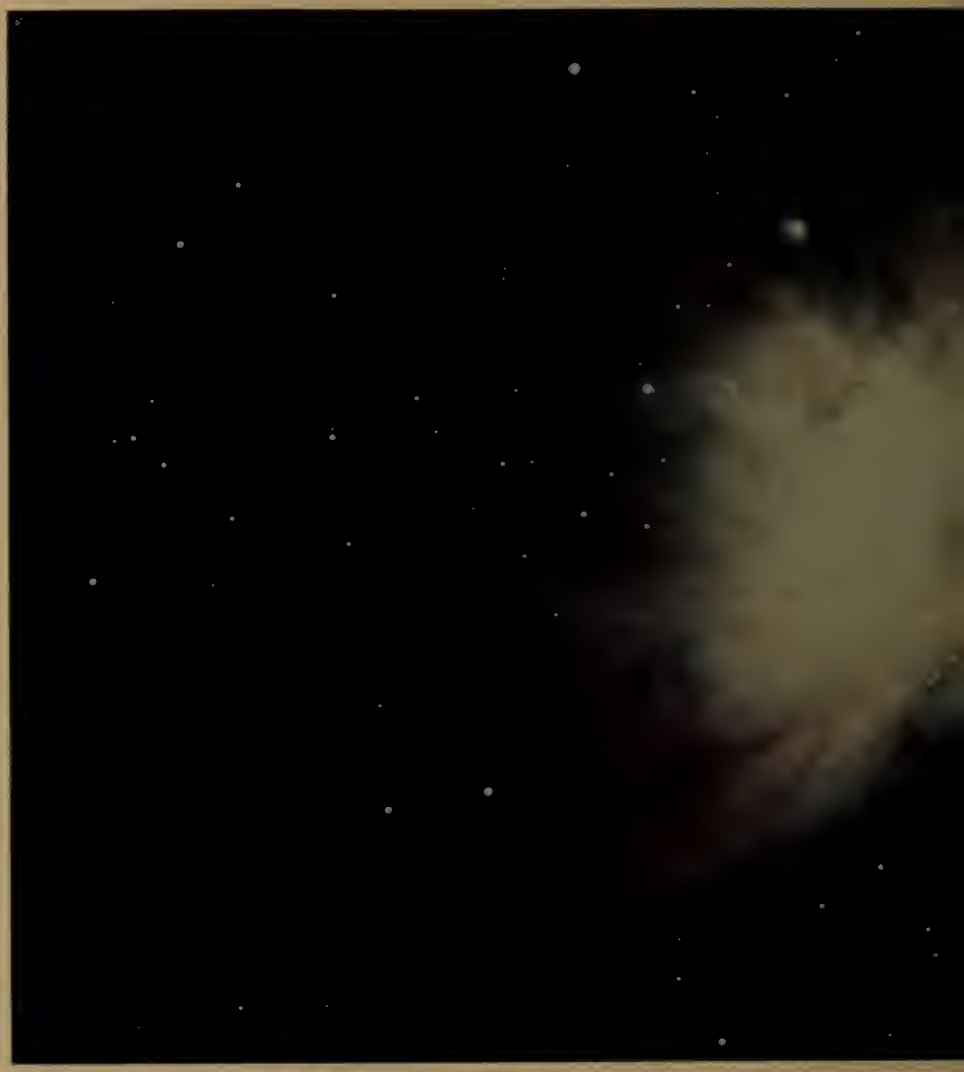
tons arriving from wherever the telescope points. While measurements can be made from the ground at the rate of 1,000 times a second, the photometer makes them at 100,000 times a second.

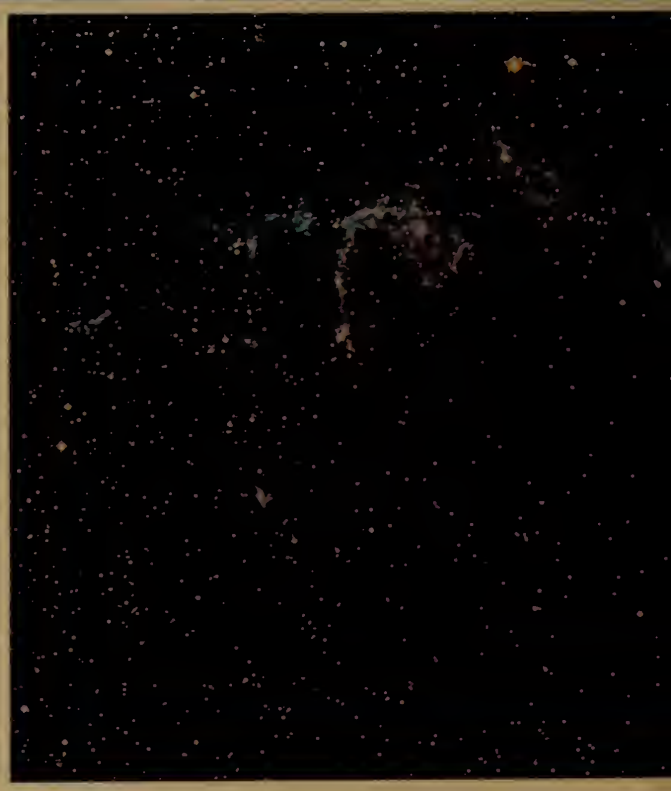
"In magnetic fields as strong as a neutron star's, weird things happen with light," says White. Light escapes from the star's magnetic poles more easily than at its equator. "Effectively, a neutron star has a little bright spot at its equator," says White. "Neutron stars are spinning around an axis, a pole. And every time the spot comes around, you see a flash." Neutron stars flash one to 1,000 times every second; they spin at one-fourth the speed of light.

Not all stars larger than the sun end up as neutron stars. A star four times the sun's size would continue to contract until its gravitational field was so strong that light could no longer escape. It would then be a black hole—and astronomers hope the telescope will let them "see" one.

Astronomers are reasonably certain black holes exist, and though, needless to say, they cannot literally see one, they think they can see its effects. The gravitational field of a black hole pulls in any surrounding material. But before going completely down the drain, the material whirls around the black hole, creating an accretion disk. "The stuff in the disk collides, creating friction," explains White. "Closer and closer to the inner edge of an accretion disk, it gets hotter and hotter. You can find a black hole by the light created by the friction in an accretion disk." In effect, then, a black hole does shine, though irregularly.

But neutron stars can have accretion disks, too. The telescope's High Speed Photometer can detect accretion disks from both neutron stars and black holes and identify which is which. Neutron stars are larger, their flashes regular and further apart. "If it is a black hole," White says, "they'll see irregular variations as fast as the Photometer can measure—100,000 times a second. With changes that fast, it has to be a black hole."





The Great Nebula in Orion (above) and the Veil Nebula in Cygnus (right) were named when a nebula—Latin for "cloud"—was just a dim patch seen by an early telescope. They represent nearly opposite events. Orion's clouds of gas and dust are raw materials which will collapse into stars, while the Veil's filaments—remnants of a dying supernova—expand into space. Space Telescope can watch both.

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Galaxies

Astronomers know that galaxies come in types. Slightly flattened or spherical, elliptical galaxies are composed of older stars and contain little of the gas and dust that might create new stars. Spiral galaxies, like our Milky Way, have a large, dense bulge at their centers and spiral arms thick with young stars and gas and dust.

Early theories linked the two types in a sequence: ellipticals were supposed to evolve into spiral galaxies. Today, however, astronomers have their doubts. "Is the difference between ellipticals and spirals evolutionary," asks Duccio Macchetto, "or has it to do with the way they were formed in the first place? The theory now is that they were born different." So the High Resolution Spectrograph will look at clusters of galaxies for signs of evolution, to see if ellipticals and spirals are parent and child or simply cousins.

Another group of galaxies called active galaxies are less a type than a jumble. They have no particular shape, but all possess extremely small, exceptionally brilliant centers. In fact, the amount of light coming from the center is a significant fraction of the light coming from the rest of the galaxy.

Astronomers are highly curious about the nuclei of those active galaxies. "The nuclei of all active galaxies lie buried at the center of the nuclear bulge," says Richard Griffiths. Looking at the bulge with ground-based telescopes, astronomers can usually see only what Dennis Ebbets calls an "overexposed blob."

With the Telescope's Wide Field/Planetary Camera, however, researchers should be able to resolve "right at the dead center of that blob, one little super-bright point." So far, the most popular explanation for the bright nuclei is that such a blaze is actually the accretion disk of a black hole.

Active galactic nuclei resemble another curiosity, quasars. First observed 20 years ago, quasars are still the most distant objects astronomers see—hundreds of millions, even billions of light years away. In theory, that means they should be hundreds of millions to billions of years old, three-quarters of the age of the universe. Quasars are a hundred times brighter than the brightest galaxy and a hundred thousand times smaller than the apparent size of a normal galaxy. It's hard to talk about quasars and avoid hyperbole.

"Then there is the fuzz, as it's called, around a quasar," says Ralph Bohlin, an instrument scientist for the Faint Object Spectrograph. Working in the ultraviolet spectrum and on the same principles as the High Resolution Spectrograph, the Faint Object Spectrograph has lower resolution, but can see things that are much dimmer and much farther away. Things such as a quasar's fuzz—which astronomers think is really a galaxy. "Few quasars have been found to have underlying galaxies," admits Bohlin, "but so far, that's because of the limitation of the instruments." (To see the galaxies around quasars, astronomers can also use the telescope's two cameras.)

The number of active galaxies and quasars seem to increase with distance. In other words, the early universe held more active galaxies and quasars than does the present. Astronomers therefore suspect that galactic evolution, active galaxies, and quasars are connected.

Quasars, for example, might be the brilliant centers of early active galaxies. And active galaxies might be what the ellipticals and spirals looked like millions and billions of years ago—violent creatures, powered by black holes of incomprehensible size. Eventually, perhaps, such galaxies settie into middle age as the spirals or ellipticals we see around us. But some memory of youth may remain; most galaxies, including ours, probably have small or inactive black holes at their centers.

Clusters

Cosmologists—astronomers who deal with the origin, evolution, and end of the universe—have evidence that the universe ex-

ploded into being 15 to 20 billion years ago. Since then, everything—space and time, matter and energy—has been drifting away from everything else.

"We know pretty much how the universe started," says Institute director Riccardo Giacconi. "However, we don't know how it went from the Big Bang to the universe we see today." In its first instants, it is generally agreed, a chaotic universe blended uniformly into a primordial soup.

Today we see a much lumpier universe. "Galaxies are not uniformly distributed in space," says Giacconi. "They seem to occur in sheets, in filaments, in knots, in structures separated by very large distances. There are islands of matter and islands of emptiness." Stars collect into galaxies, galaxies into clusters of galaxies, clusters into superclusters separated by voids of millions of light years. Only on the largest scale—superclusters and beyond, a billion light years—is the universe uniform. How did the present structure develop out of homogeneous chaos?

"There are two main-line theories," says Giacconi. Both assume that as the earliest universe expanded and cooled, clumps or inhomogeneities in the general uniform density occurred at random. "But what is the scale of these inhomogeneities? Is it small, of a size that could condense into a star or a galaxy? Is it much larger?

"One theory assumes that small inhomogeneities can occur and that stars and galaxies formed first." Stars, galaxies, clusters, and superclusters would merge by mutual gravitational attraction. This is the hierarchical theory.

The pancake model, on the other hand, theorizes that clumps the size of a star or galaxy would have dissipated in the early chaos, so that only supernova-sized clumps would have survived. "These largest inhomogeneities were in the form of pancakes, wide in one direction, narrow in the other," says Giacconi. "These enormous clumps then fragmented, and out of the pieces came the clusters, then the galaxies, and finally the stars."

The two theories also differ in the age they assign to the galaxies. In the hierarchical model, galaxies formed almost at the Big Bang and are about 20 billion years old. In the pancake model, galaxies are younger, around 17 billion years old.

Here is a dispute the Space Telescope probably can resolve, for the Wide Field/Planetary Camera will be able to see approximately 13 billion light years back in time, far enough to see young galaxies—if the pancake model is right. "If we find absolutely no indication of galaxy evolution going back to 10 billion light years," concludes Giacconi, "I think the pancake theory would be difficult to sustain."

The Future of the Universe

Cosmologists not only want to look into the past, they also want to see into the future. They want to know whether the universe will continue to expand, opening forever. Or will it finally reverse and fall in on itself, closing down into a hot, infinitely dense and singular point?

The universe is unquestionably expanding, astronomers agree, but because the gravitational attraction of all its mass pulls it back together, expansion is slowing. Thus the fate of the universe depends on how much mass it has: An open universe will be populated sparsely, but if the universe is dense enough, the laws of physics indicate it will eventually pull together. Find the amount of mass and how far apart it is—in other words, find the density—and you know the fate of the universe.

Density depends in part on what astronomers call the distance scale. The easiest way to measure the distance to a star is called trigonometric parallax. Pure and simple geometry, trigonometric parallax is the most accurate of all the methods: Locate the star against a background of other stars and measure its apparent movement after six months. Then, knowing the size of relevant angles and the distance from one side of Earth's orbit to the other, you can calculate the long arms of the triangle, the distance to the star.

Other, less accurate methods of measuring distance are statistical. That is, they depend on observed relationships: The farther a star appears to travel in one year, the closer it is. For a variable star like those called Cepheids, the longer the period of variation, the more intrinsically bright it is. The fainter a star of known brightness, the farther it is. The more intrinsically bright a star, the more massive. The more massive, the bluer.

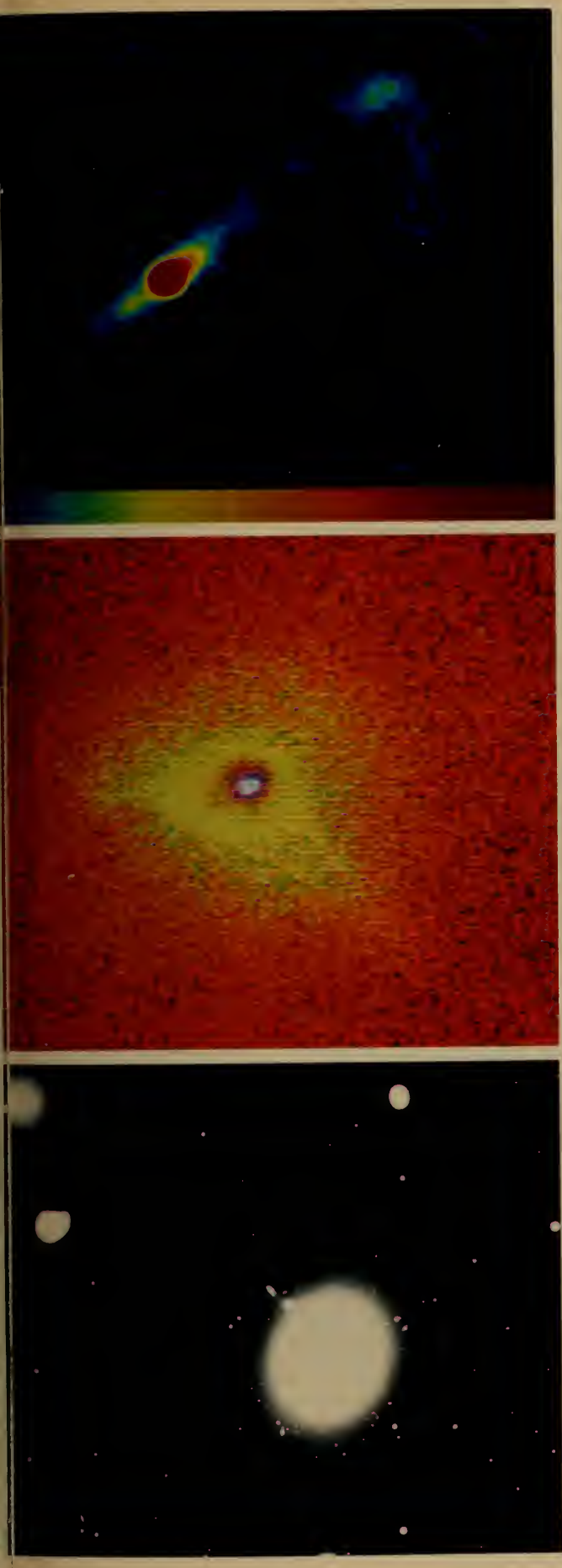
Such relationships begin to look like a house of cards, all resting on the parallaxes of a few nearby stars. "Parallax is the base of other measurements of distance," says Alain Fresneau, instrument scientist for the Fine Guidance Sensors. "If you enlarge this base, you will improve everything."

"For the moment," he says, "we have good parallaxes of stars in the vicinity of the sun, up to 50 parsecs." (That's roughly 150 light years.) "With the Fine Guidance Sensors, it will be possible to go out to 1,000 parsecs." That's accuracy to a distance of 3,000 light years, to the arms of our galaxy.

And it should be possible to go farther yet. The High Speed Photometer, Faint Object Camera, and Wide Field/Planetary Camera will refine measurements of stars' periods, brightness, masses, and colors. Researchers plan to check distances derived from these relationships against distances derived from parallaxes—making the distance scale accurate out as far as the great clusters of galaxies.

Measuring distances is one step in measuring the universe's density; calculating its mass is another. To estimate mass, astronomers use the same sort of relationships used to estimate distance, but on a larger scale. They begin with what they know: a bright galaxy has more mass. The way a galaxy rotates reveals its mass. The motion of galaxies within clusters reveals how much mass is in the cluster.

Yet when astronomers compare the amount of mass implied by brightness with the amount of mass implied by rotation or motion, they find discrepancies. Bright-



Three ways of looking at an active galaxy and its small, exceptionally bright center: Radio spectroscopy of the large radio galaxy NGC 315 (top) points out its mysterious jet with its two hot spots. The nucleus of M87, which also has a jet, is seen in the X-ray wavelength (middle). A ground-based, optical view of M87 (bottom) shows the nucleus as "an over-exposed blob." ST should resolve the dead center of that blob, a super-bright point that perhaps is the accretion disk of a black hole.

ness, which counts only visible matter, gives a considerably lower mass than the other measures, which count all matter. Therefore, 80 to 90 percent of the universe's matter must be dark—invisible. Astronomers call it the missing mass.

"We know where some of the missing mass is," says Neta Bahcall, one of the Institute's few cosmologists. "It surrounds galaxies, it is found in the clusters of galaxies, and even the bigger systems, the superclusters, contain it." The dark matter is evident only by its effects on the rotation and motions of galaxies. Looking around in the dark, Space Telescope will refine the measurements of mass it cannot see.

So far, astronomers can only guess at what the total of that missing mass might be. Currently, the favorite theory points to elementary particles of matter with so little mass that they very seldom bind gravitationally—yet exist in such great numbers that their mass is a significant fraction of the mass of the universe.

And then there's serendipity, quite literally a project in the Institute's original proposal. "The most interesting things, by definition," explains Ralph Bohlin, "are the ones we haven't seen yet." So 15 percent of Space Telescope's observing time will be labelled Director's Discretionary Time. It is precious time left open in a tight schedule to investigate the inevitable surprises, the things no one expected.

Anything else?

"We will be able to ask questions which seem crazy, seem fanciful to ask," says Riccardo Giacconi. "The fundamental question, I think, is whether the universe is precisely the result of the intrinsic properties of matter. Once you have the physical laws and once you're given the first fluctuation, does it all follow? If, after the first instant, everything was driven by necessity, then we want to understand that necessity. We are asking some of the most profound philosophical questions you can ask about the universe."

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ROBIN HOOD REVISED

The legend of the merry outlaw began more than 700 years ago. His history is vague but, says a British historian, one thing is clear: Robin never robbed the rich to give to the poor.

By James C. Holt

Robin Hood is regarded by many, including some historians, as an archetypal hero who successfully defied unjust authority—personified by the wicked sheriff of Nottingham—and righted the ills of society by robbing the rich and giving to the poor. His legend has survived for more than seven centuries, with some changes and adjustments certainly, but with the essentials preserved: so far no film maker has armed Robin with a space-gun or dared to change the sheriff into a good cop.

But where did the legend come from, and how much of it is true? The story has been told and retold so often, acquiring layer after layer of accretions catering to the tastes of each new generation. What do we really know about Robin Hood?

The first known reference to Robin Hood occurs in a version of William Langland's *Piers Ploughman*, composed in 1377, in which Sloth is made to say:

I do not well know my Paternoster as the priest sings it.

But I know rhymes of Robin Hood and Randolph Earl of Chester.

So far so good, but the question of origins remains, for plainly Langland's "rhymes" were already current. How old was the legend when he alluded to it and how was it transmitted?

The first tales to survive in manuscript come from about 1450. *Robin Hood and the Monk*, found in a manuscript collection that includes a prayer against thieves and robbers, is a thriller, a story of treachery and revenge. Robin is betrayed to the sheriff by a knavish monk and is then rescued from Nottingham Castle by Little John and the rest of the gang. *Robin Hood and the Potter*, part of a manuscript collection of romances and moralistic pieces probably written shortly after 1503, is by contrast almost a burlesque. Robin, after challenging and fighting a traveling potter, takes the potter's dress and wares to inveigle his way into Nottingham Castle and lure the sheriff to the outlaw lair in Sherwood.

The *Gest of Robin Hood*, most probably written in the 15th century, is a collection of the current tales of Robin Hood. It attracted the attention of early printers, and between the last years of the 15th century and the middle of the 16th century there appeared no less than five editions of this lengthy poem describing the deeds (gest) of Robin Hood. The *Gest*, a minstrel's serial to be recited at intervals, includes what is perhaps the earliest story of all, the tale of the impoverished knight. In this story, Robin assists a knight who has mortgaged his lands to the Abbot of St. Mary's York, by robbing the monks themselves to repay the loan. The *Gest* also includes the encounter of the King and Robin in Sherwood Forest and a summary tale of Robin's death at Kirklees.

These early versions contain nothing of the legend that is taken for granted by 20th-century readers. There is nothing of King Richard the Lionheart or of his ill-famed brother, Count John; the only king given a name is Edward "our comely king," which leaves a wide choice—by 1327 there were three Edwards.

There is no Maid Marian; she only came into the story about 1500, when it was already centuries old. Robin is not of noble birth; that was a social gloss first applied in the 16th century and given color by fictitious pedigrees of the 18th century which made him Earl of Huntingdon. In origin, Robin Hood is a simple yeoman.

He did not lead the English resistance to the Normans; that element came into the legend in 1819, with Scott's *Ivanhoe*. He does not resist royal taxes; the only tax mentioned in the earliest tales is pavage, a tax imposed for the paving of marketplaces and the like. And Robin, far from resisting the tax, is trying to levy it.

The earliest tales contain next to nothing of Robin's robbing the rich to give to the poor. That he was a "good outlaw" who "did poor men much good" was tacked on to one tale almost as an afterthought.

"Robin Hood and Maid Marian in Their Bower," from* Bold Robin Hood and His Outlaw Band, *"penned and pictured by Louis Rhead" (Harper & Bros., c. 1912).

The Newton White Collection, Special Collections Division, Milton S. Eisenhower Library, Johns Hopkins University; all other illustrations are from the university's John Work Garrett Collection.

The question of Robin Hood's origins remains, and there are several routes to an answer. One, of course, is to identify the "real" Robin Hood. The earliest candidate for the role is one Robert Hod, who was recorded as a fugitive before the King's justices at York in July 1225. The account recurred in the following year when the name appeared in the more colloquial form, Hobbehod. Unfortunately, the plea roll which might have contained details of the charges against him has not survived. Only one thing is certain: Robert Hod had fled the jurisdiction of the court. He was an outlaw. He is the only possible original of Robin Hood, so far discovered, who is known to have been an outlaw. Without more evidence, however, the matter is inconclusive.

Another path is the study of literary analogues. This approach links the legend with some of the knightly romances of the 13th century, particularly the tales of Fulk fitz Warin, a baron of the Welsh Marches who was an outlawed rebel against King John (1200–3), and of Eustace the Monk. This monk took to the woods in 1203 against his lord, the Count of Boulogne, and ended his days as a soldier of fortune when he was defeated at the battle of Sandwich in 1217. Fulk and Eustace live their lives as outlaws in the forest, just as Robin Hood does. All show a remarkable prowess with arms. There is no one to resist them; they may be undermined by treachery or overpowered by numbers but, if so, they gain release through skillful ruse and the base stupidity of their captors. Some of the analogous material must have been transmitted from one tale to another.

Approaching the legend through its geographic background links it with the great baronial estates of Pontefract, which encompassed parts of both Lancashire and Yorkshire and through which the major roads north from London led. Barnsdale and Clitheroe were both Yorkshire properties of the de Lacy family, lands which came to the earls of Lancaster through the marriage of Alice de Lacy to Thomas of Lancaster in 1292. The yeomen who served, and the minstrels who often stayed at, such households helped disseminate the legend throughout the Pontefract holdings—and beyond.

When "Robin Hood meeteth the tall Stranger on the Bridge," Little John dunks the outlaw. From* The Merry Adventures of Robin Hood of Great Renown, *illustrated by Howard Pyle.

Finally, there is the study of names: not place-names, for they mark the subsequent dissemination of the legend, but surnames in the form of "Robinhood" or some equivalent. The earliest example has long been thought to be Gilbert Robinhood, who appears in Fletching, Sussex, in 1296. Other examples occur in London in the early 14th century. (There is no difficulty in understanding how the fame of the legendary outlaw might have been carried from Barnsdale in south Yorkshire down the Great North Road to the London taverns. In contrast, Fletching, to the south of London in Sussex, seems a far cry from Barnsdale: but not in terms of feudal property, for the lord of Fletching in 1296 was none other than Thomas of Lancaster, husband of Alice de Lacy of Pontefract.)

Such evidence is admittedly wondrous thin and the logic finespun. After all, the name Hood was not uncommon; men called Robert Hood appear frequently enough in the existing records to preclude the snap identification of any one of them with the legendary outlaw. But the combination Robinhood is extremely rare. Even so, all such surnames could simply be dismissed as straightforward patronymics. In the same vein, children of a Robert Hood could also be known as fitz Robert, or Robertson, or Robinson, or Hudson, or Hodson, or even just plain Hood. And, more commonly, they were. In fact, Robinhood was a very rare form of surname, and so the hunch, the historian's sixth sense remains: The tales were sufficiently well known by the end of the 13th century to account for the adoption of a rather strange surname.

The weight of the accumulated evidence indicates that the legend's central locus is Barnsdale. (Most probably, Nottingham was later emphasized simply because it was a larger, better-known town.) The first tales, like that of the knight in debt to the abbot, had a knightly flavor that seems suited to a 13th-century audience. And it is likely that the tales have at their base a real outlaw.

An exciting new lead has recently been found by Dr. David Crook of the Public Record Office, London. Dr. Crook has now found yet another Robinhood surname (which is the subject of a note by him shortly to appear in *English Historical Review*). The name occurs in the Memoranda Roll of the King's Remembrancer of 1262, where the Prior of Sandleford, Berkshire, was pardoned a penalty imposed on him for seizing the chattels of one William "Robehod," fugitive.

That mention advances the earliest of such names by a matter of 34 years. And it has proved to be of much greater significance. For, by the luckiest chance of survival, the entry on the Memoranda Roll can be matched with an entry on the roll of the Justices in Eyre in Berkshire in 1261. The Eyre entry is an indictment of a crimi-

nal gang, both men and women, suspected of robberies and the receiving of robbers, who had fled the jurisdiction of the court and were outlawed. They included William, son of Robert le Fevere (Fevre=Smith), and there is no doubt, considering the precise details available, that this man and the William Robehod of the Memoranda Roll are one and the same.

Quite simply, somewhere along the administrative chain between the Justices in Eyre and the Remembrancer in the Exchequer, one of the clerks—perhaps even the Remembrancer's clerk—changed the name. And what led the clerk to do so was the fact that William son of Robert was a member of an outlaw gang indicted for robbery. The outlaw became William Robehod.

The clear inference is that the man who changed the name knew of the legend. And thus the earliest reference to Robin Hood as a legendary figure must now be taken to be not 1377 *(Piers Ploughman)*, but 1261–2. In all senses, that is an enormous advance.

This discovery by Dr. Crook demonstrates beyond serious doubt that Robin Hood surnames did indeed derive from the legend, rather than the reverse. But its importance stretches far beyond that. First, the new discovery imposes strict limits on the search for a historical Robin: All candidates later than 1261–2 can now be firmly eliminated. Much Robin Hood scholarship concerned with establishing him in south Yorkshire in the 1320s must now be jettisoned. Robert Hod, fugitive of the York justices in 1225, now has a clearer field; indeed, the nickname that he was given on the rolls in 1226, "Hobbehod," may well reflect the emergence of the legend.

Old, well-known evidence, which has been played down in recent years, suddenly looks refreshed. The Scottish historian John Major, writing in 1521, believed that Robin Hood and Little John were active in 1193–4. A tomb with epitaph that survived at Kirklees in the late 17th century recorded that Robin died in 1247. The persistence with which these and other sources associated Robin with the late 12th and early 13th centuries is now explicable. John Major was probably right, and many modern scholars are proved wrong.

A second consequence of Dr. Crook's discovery will be more difficult to assess. Until now literary scholars, relying on 1377 as a rough point of origin for the legend, have assumed very reasonably that the analogues that the tales of Robin share with the knightly romances of the 13th century arose in the earlier knightly romances of Fulk fitz Warin and Eustace the Monk and spread to the later yeoman ballads of Robin Hood. It now appears that romances and ballads all took shape at one and the same time; it is easier to understand how they came to share material, but it can no longer be so certain which was the source and which the recipient. The earlier the Robin Hood legend is pressed, the more original it is likely to be.

A third consequence is even more important. If any real Robin Hood existed, it was thought, he had to exist before 1377, the *Piers Ploughman* reference. Early manuscript tales of Robin appearing around 1450 then made sense, because it seemed reasonable that a story should take 50-odd years to move from fireside tale into written form. But an interval stretching back from c.1450 to before 1261–2 is a much more serious gap. The inference is that the stories known in 1261–2 by the clerk who called the outlaw William son of Robert "Robehod" were probably very different from the diversified tales which appear in written verse from the middle of the 15th century.

Perhaps the earliest tale of all: "Merry Robin Stops a Sorrowful Knight." The Howard Pyle illustration appears in the 1925 edition published by Scribner's.

What went on in the intervening years? There are only a few indications of what the Robin Hood stories contained at any particular point. In 1432, for instance, the clerk of the sheriff of Wiltshire concocted an acrostic in his parliamentary return for the county that associates "Reynold" with Robin's gang: From that clue, it seems certain that the clerk knew the tale in which Little John assumed the alias of Reynold Greenleaf—or that he knew some similar yarn. The tale of the King's visit to Sherwood is plainly based on the progress of Edward II through the northern counties in 1323; therefore it cannot have been embodied in the legend before that date. Besides those two reasonably fixed points, it is possible to say that some elements in the legend—such as the tale of the Knight and the Abbot of St. Mary's, with its connections to Barnsdale, where the tales are thought to have begun—are likely to have been earlier, others later. And that at present is all we can say.

Within this long period of gestation there are continuous, consistent themes. In 1261–2 the legend was known to a clerk at work most probably in the Exchequer—in our parlance, the clerk was a civil servant. So the legend was circulating at that social level. What triggered the clerk's consciousness was not a tale of some heroic medieval prototype of Che Guevara but the record of a gang of outlawed criminals: robbers and receivers of robbers. The same statements can be made about the references to Robin in the late 14th and 15th century. Such references come mostly from a middling social level and they are largely derogatory. (The sheriff's clerk in Wiltshire in 1432 is apparently the first to describe Robin as a good man. He included in his acrostic the phrase, "Good man was hee.")

The story's origins are intermingled with the aristocratic and gentle household; the geographic detail both in the tales' content and in the distribution of personal names suggests that one great household, that of Lacy/Lancaster, played a role that is still reflected in the evidence. The legend's heroes are yeomen—middling household

officers, youths at the beginning of their careers. The tales are remarkable for the absence of sex, family, and family property. They were retailed by minstrels who passed through, or who were permanently employed by, the household.

And that is how the legend spread and changed. Such households were itinerant. Yeomen in particular ranged afar as archer-bodyguards, messengers, sometimes as foresters and huntsmen. Minstrels, above all, traveled, performing not only before noblemen and gentry but also before bishops, in monasteries, and especially in the marketplace; anywhere, indeed, with a sufficient audience to suggest the possibility of reward. The legend's resulting diversification was already apparent in the first surviving tales. There are scenes in *Robin Hood and the Potter,* for example, that would have made the most sense, and perhaps had the most immediate appeal, to the folk of Nottingham.

***"Robin Shooteth his Last Shaft," by Pyle. ". . . and sett . . . mine arrowes at my feete," says Robin in the* Gest.**

By the middle of the 14th century, Robin seems to have been invading popular iconography. The sculptures in the north aisle of Beverly Minster (c. 1340), which celebrate the Beverly Guild of Minstrels, include a spandrel carving of a remarkably convincing longbowman. Furthermore, one of the misericords (c. 1430) in St. Mary's Beverly, which was the Guild's church, has been taken by some to represent Robin Hood and the King.

The most important development of all was that the legend overflowed the bounds of minstrelsy and invaded both folk festival and theater. Much new light was shed on this development by David Wiles's *The Early Plays of Robin Hood* (Boydell and Brewer, 1981). Indeed, Wiles is disposed to argue that in the developing tradition, the plays were primary and the ballads secondary. This is unlikely to be accepted. Still, Wiles rightly draws attention to the fact that the first recorded performance of a Robin Hood play took place before the Mayor of Exeter as early as 1427.

Certainly within 50 years or so of that date came a theatrical development that involved Robin Hood in the May Festival, first as a participant in the May Games and ultimately as King of May. It was in this last development, in my view, that Robin at last—near the start of the 16th century—acquired the reputation of robbing the rich to give to the poor.

The celebration of the Spring Festival is, of course, very ancient. In medieval England it began with youths and maidens returning from the woods at dawn on the first May morning, adorned with sprigs, branches, and flowers. As they processed, they decorated houses and sought payment for their display. This collection, "gathering," or *quete* was an almost inevitable concomitant of such processions.

Now, what could be more natural than that the most famous human denizen of the greenwood should accompany the youth on their return? And what more suitable role was there for the most successful of all robbers than that he should be put to the charitable purpose of conducting the *quete?* For that is plainly what Robin did.

Robin Hood's gatherings, which begin to appear in local records before the end of the 15th century, are not riotous assemblies of men but charitable collections of money. In some southern townships, especially at Reading and Kingston upon Thames, these celebrations were controlled by the church wardens and are recorded in their accounts. At Kingston, the wardens provided for the expense of the display: Kendal (green) cloth for Robin, Little John, and Maid Marian, white cloth for the Friar, and other items. The wardens received sums from the gathering.

And, perhaps most significant of all, the wardens accounted for expenditures on items that indicate how the gathering was done and how many contributions were expected: in 1506, 4s. 2d. to John Painter, who supplied 1,000 "liveries" or badges, 3s. 8d. to William Plott, who supplied 1,200 "liveries and 40 great," and 10d. to the same for 2,500 pins. Robin had become the central figure in a flag-day.

A flag-day is an occasion, now almost peculiar to Britain, in which ladies of charitable instincts conduct well-organized collections by selling lapel flags or badges—in aid of wounded veterans before Remembrance Sunday (when the badge is a Flanders poppy), or for the national Life-Boat Service, or for national societies for the protection of children or the support of orphans.

Robin collected from those who had money to give and accounted for his collection to those who administered the charitable funds of the parish. Thus he took from the rich to give to the poor.

This could have happened by a kind of easy elision of associations. Or it could equally have been the brainstorm of some long-forgotten church warden who envisaged exploiting Robin's reputation for charity. At all events, it left an enduring mark on Robin's reputation.

Something else also endured. At Kingston in 1506 the contributor bought a pin or livery great or small. The livery was a sign that he had joined Robin's *mesne,* band, or company. Those who buy their flags on similar charitable occasions today rarely reflect that they identify themselves with a mark that originated as a feudal livery—or with an outlaw hero.

James C. Holt is the author of Robin Hood *(Thames and Hudson, 1982). Professor of medieval history at the University of Cambridge, where he is also master of Fitzwilliam College, Holt is president of the Royal Historical Society. He first became interested in Robin Hood when he taught at the University of Nottingham.*

There *Are* Jobs Out There

But finding them may take more than a degree, say five young alumni.

By Ruth Trask

Frederick Rucker, '81 ME, and Michael Graham, '74 MG, responding to questions at a recent recruiting workshop on campus.

The theme of WPI's recent annual Placement Seminar was ominous enough: "The Student Hits Hard Times." But alumni Judy Nitsch, '75, Phil Cameron, '79, Fred Rucker, '81, Jack Zorabedian, '72, and Michael Graham, '74, told an understandably attentive audience of WPI seniors that there are indeed ways to succeed in a tough job market.

First came a humorous "Star Wars" slide show depicting do's and don'ts for job seekers, given by recruiter Frank Consoli of Procter & Gamble. Then Dr. Spencer Potter, placement director at Clark University, moderated the main event: the alumni panel discussion, arranged by Bill Trask, WPI's director of graduate and career plans.

Fred Rucker, '81 ME, a manager in the equipment engineering department for AT&T Long Lines, advised the seniors, "Know the company you're interested in. Know yourself. Sell yourself. Be honest enough to let the recruiter know that you want to succeed—that you want to earn money. Don't say something vague about wanting to work with people."

When Rucker started with AT&T, he worked in operations. Subsequently, he held an engineering and management post. He is now moving into a corporate personnel position in New Jersey, where he will employ his general management skills.

"I used three different résumés as a senior," said Phil Cameron, '79 CE, a senior project engineer at Clairol. "I wanted to keep my options open." First, he asked himself, "What kind of company would use a civil engineer? How could I fit in?"

Cameron not only was interested in hearing the recruiters' questions, but also turned the tables. "I asked them about their experiences with the company."

He admits it may seem odd that a CE works for Clairol, but he found what he wanted at Clairol in general management. Initially a project engineer concerned with new products, he later became an on-line supervisor in packaging and worked in industrial engineering.

"By the time I returned in April from my senior semester in London," Judy Nitsch, '75 CE, said, "the recruiters were gone. I contacted companies on my own."

One company she wrote was Schofield Brothers, Inc., Consulting Engineers and Land Surveyors in Framingham, MA. "A WPI graduate hired me as a project engineer." Within three years she was named vice president of a Schofield division, Freeman Engineering Co., in Attleboro. In 1982 she joined Allen & Demurjian, Inc., Consulting Engineers, Architects and Land Surveyors, Boston, which recently promoted her to vice president.

Nitsch emphasized that small companies, like Schofield and Allen & Demurjian, should not be overlooked. "They're easy to check out and they may give you job offers sooner than larger ones!"

Michael Graham, '74, has a BS in management engineering from WPI and an MBA from RPI. "But I didn't go directly from WPI to RPI," he reported. "I feel it's a mistake to start on your MBA as soon as you graduate. Get some professional experience first."

Like Judy Nitsch, Graham believes that small companies have much to offer, including "the chance for rapid advancement." In 1974, he joined Albany International, a high-tech fabric company, rising quickly through the ranks.

In 1980, he became affiliated with Bausch & Lomb, a manufacturer of contact lenses, ophthalmic products and scientific instruments. At 31, he is a corporate director of compensation and benefits.

He's now also studying evenings for his PhD in industrial and organizational psychology at RPI. "Working full time and studying part time has been a successful formula for me."

"You may not stick with your first job for life," said panelist Jack Zorabedian, '72, a chemical engineer and quality assurance manager for new products at Digital Equipment Corporation. "While you're with your first company, get all the experience you can."

Zorabedian stressed that mechanical and chemical engineers should not be afraid to look at nontraditional companies for jobs. High-tech firms hire MEs, he said, for cabinetry and boxing, and chemical engineers for the manufacture of circuit boards and coatings. "As a matter of fact," he continued, "there's less competition for chemical-engineering applicants at high-tech firms than at chemically oriented companies."

Jack urged the seniors to highlight their achievements on their résumés. "If you've had a summer job, co-op or project experience, say so," he said. "Show the company that you have a record of getting things done. It's vital to your job search."

Riding the Space Shuttle

Student projects will really get off the ground soon, with a little help from a friend.

Students Eric Thune (left), Gerard Earabino, Peter Schibley and David Dymek work on an Earth-imaging system. At right, Prof. Fred Looft (seated) and Robert Labonté want to place five student projects on a Space Shuttle mission.

Space, says Robert Labonté, '54 EE, "for all its allure, its mystique, its potential for enriching the human endeavor, remains a pretty unneighborly place for the engineer."

Labonté is Associate Department Head for Systems Architecture at MITRE Corporation, a nonprofit, government-supported firm that performs systems engineering work. Entering and using space—perhaps our most foreign and distant of research laboratories—present unprecedented challenges, he says. In that grand and weightless void, up is down and down is up. Yet, as we know, space can provide many conditions ideal for developing and testing advanced industrial, agricultural, medical and other technologies.

Sometime in 1985, NASA's Space Shuttle will once more thunder aloft, ferrying a precious payload of experiments adapted especially to the rigors of space flight.

Nestled near the center of its huge, 60-foot-long cargo bay will be a five-cubic-foot canister. Its 200-pound cargo will consist of five experiments designed, built and tested not by industrial engineers or government scientists, but by some of WPI's most creative and adventurous undergraduates. The sponsoring role of MITRE in this enterprise is vital to the project's success. Labonté's part in the program has been indispensable.

One of these self-contained experiments will be a solid-state multispectral Earth-imaging system—in lay terms, a sophisticated device to be used in observing and recording from space such earthbound phenomena as agricultural problems, weather patterns, earthquake activity and mineral deposits.

This project is the work of junior Gerard Earabino of Syracuse, NY, and seniors David Dymek of Fitchburg, MA, Frederick Gummow of Middlebury, MA, Peter Schibly of Green Bay, WI, and Eric Thune of Brooklyn, NY.

"Where the technology of our imager departs from that of conventional systems," says Thune, "is in how images are recorded." Virtually every satellite imager ever developed, he says, has relied on either film or an electrical or electromechanical scanning system. Military reconnaissance satellites, for example, often use a film canister which, when fully exposed, is jettisoned back to Earth to be retrieved and developed.

WPI's solid-state "camera," says teammate Dymek, has just three moving parts, needs little power and is less likely to break down under the tremendous vibrations of blastoff and re-entry from space. It's also smaller and lighter than its mechanical counterparts, weighing just 18 pounds.

The MITRE-WPI-Space Shuttle projects are part of NASA's Small Self-Contained Payloads program—best known as the Get Away Special (GAS). Professor Fred Looft, EE, heads the WPI program, which has come to be called the GAS-CAN(ister) Project.

Looft is as exacting a chief adviser to the 40 GASCAN project students as he is an administrator. "Working with NASA," he says, "you have to be. My job and that of the 17 or so other faculty advisors is to ensure the highest possible quality in each experiment while staying within budget and on schedule." It's a real challenge, but Looft seems to have the right stuff for the job: he has twice been an applicant for one of the most exclusive fraternities of all—a NASA flight team. "I may give it one more try," says the fit, bearded Looft.

Construction of the Earth imager began in October 1983. By spring, says Looft, a

working prototype will be completed. At that time, like other GASCAN projects, it will be turned over to a new project team, who will develop the imaging system that will actually go aboard the Shuttle.

Says Labonté of MITRE, "Teamwork is the key here. MITRE is providing financial and professional support; the students work over several years to put a working system into space.

"At MITRE, we're interested in studying all of the operations involved in developing, launching and retrieving experimental packages using NASA space vehicles." The company, he adds, is also committed to providing students opportunities for professional-level work in this area. "We simply saw a fit between our objectives and those of WPI when we offered to donate the canister and our technical advice for student research."

Says Looft, "These projects are for real. They call on students to prepare and defend proposals, meet strict schedules, integrate system elements and honor cost guidelines."

In all, 11 projects have been selected for further work. Eight are actual experiments, such as one to determine whether a gravity-free environment promotes the growth of large zeolite crystals. Another will develop a mechanical method for generating energy in space, using a non-chemical, non-photovoltaic method.

The remaining three projects will provide support for the technical experiments. One will develop and integrate a structure within the canister to support the five experiments—no trivial undertaking itself. Another team is publishing biannually the *Get Away Special Journal,* to keep all concerned parties well informed of the program's progress. The journal is especially vital since several successive teams will work on each project.

"We've encouraged projects that are not simply repeats of previous space experiments," says Looft. "These students, some of our best, must develop and test prototypes, build the space flight hardware, integrate the experiments into the GAS canister, launch, monitor and recover the packages, and finally analyze post-flight data. You begin to understand why this is a multi-year program."

"You might ask," says Labonté, "whether engineering students are capable of proposing, designing and developing equipment that can withstand the rigors of space flight *and* meet NASA safety and design standards. We would say emphatically, YES!"

Adds Looft, "Although faculty dedication is vital, we're not saying that, when a problem occurs, a faculty member will step in to solve it. We try to help students envision answers to difficult problems and broaden their perspectives—by bringing science, for example, into engineering. But the experimental protocols have been proposed by, and will be developed and implemented by, the students, not the staff."

WPI CLASS NOTES

WPI Alumni Association
President, Harry W. Tenney, '56
Senior Vice President,
Donald E. Ross, '54
Vice President,
Paul W. Bayliss, '60
Secretary-Treasurer,
Stephen J. Hebert, '66
Past President, Peter H. Horstmann, '55

Executive Committee
Members-at-Large
Henry P. Allessio, '61; Walter J. Bank, '46;
William J. Firla, Jr., '60;
John M. McHugh, '56

Fund Board
Gerald Finkle, '57, Chair
Allen H. Levesque, '59, Vice Chair
Edwin B. Coghlin, Jr., '56
Richard A. Davis, '53
Gerald T. Dyer, '56
C. John Lindegren, Jr., '39
Philip H. Puddington, '59
George P. Strom, '56

1916

J. Arthur Blair is currently residing in a Lutheran retirement home in Anaheim, CA. He says, "The weather is wonderful here. Ten times better than in Florida!" One of his sons lives nearby, and a secretary comes in twice a week to type his letters. Prior to retirement, he worked 42 years for Campbell Soup Co., Camden, NJ.

Carl Burgess writes that he still drives his car. Also, he "plays an adequate game of bridge and reads almost anything that is available in print." In 1964 he retired from the Northern Pacific Railway after nearly 48 years. He prefers the "harsh" Minnesota winters among his friends, rather than traveling to warmer climates.

Leslie Chaffee, of Tacoma, WA, who spent his career with the family lumber and wooden box business, Chaffee Brothers Company, Oxford, MA, is happy that he retired "in this glorious Northwest with its wondrous mountains." He is a past president of the National Wooden Box Association. Once active in town and church affairs in Oxford, he is a former vice president of the Webster National Bank. In Washington he has been a SCORE counselor for the Small Business Administration, a church trustee and an active member of the Tacoma Engineers Club.

Tom Delaney says that he's been in good health generally but resents getting tired when he tries to do physical work. He had a slight stroke recently but he reports that now "it seems to be licked." Delaney resides in Branford, CT.

Ray Gambarano has a number of hobbies: acrylic painting, and making furniture, birdhouses and feeders, as well as clocks of all types. Through his hobbies, he has been featured in the local newspaper and on TV. In 1928 he manufactured some of his inventions in the automotive field in his own firm, Rico Mfg. Co. In World War II the company started doing tool and machine work, and the firm's name became Rico Machine Co. Ray invented, designed and built several types of machines. He sold the company in 1950.

Roland Horne retired in 1948 after 32 years in the U.S. Coast Guard and Geodetic Survey, now a part of NOAA. From 1949 until 1964, he taught engineering subjects at Los Angeles City College, where he "wound up as associate professor." The Hornes reside in Auburn, MA.

In 1957, after 41 years of service, **Merle Phipps** retired from Fiske Carter Construction Co. During his career he helped construct many buildings in Massachusetts as well as in the South, including schools, churches and cotton mills. Since retirement he has been enjoying "a little hunting and fishing."

C. LeRoy Storms, Class Secretary

1924

Reunion **May 31–June 3, 1984**

1927

"Ted" Lewis, father of the annual Shrine Maple Sugar Bowl football game between New Hampshire and Vermont, served as one of the honorary grand marshals in the pre-game Shrine parade held on Aug. 13th. Back in 1954, when Ted was Potentate of the New Hampshire Shrine, he thought up the bowl idea as a vehicle for raising money for crippled and burned children. Since that time, about $2 million has been raised for the Shriners Hospitals for Crippled and Burned Children from the annual rivalry.

1929

Reunion **May 31–June 3, 1984**

1930

David Bragg, a retired 35-year employee of the Foxboro Co., was recognized as a 50-year member of the ASME at the October meeting of the Boston section of the society. Bragg spent most of his Foxboro career with the research department. He is the co-holder of one patent.

On July 14th, **Ed Delano** placed first in the men's 75-79 age group in the U.S. Cycling Federation National Time Trial Championships held in Tallahassee, FL. Says Ed, "I beat eight riders out of 116 who were 30 and above; six riders out of ten, 60 and above; and four riders out of five, 70 and above."

Catherine and **John Lampron, Jr.,** of West Springfield, MA, observed their 50th wedding anniversary on Oct. 12, 1983, with their two daughters, sons-in-law and five grandchildren on hand for the celebration. John, who is recuperating from a serious illness, would enjoy hearing from his classmates.

George Perreault is now living at a nursing home in Greenwich, CT. He and his wife, Dorothy, have one grandson and four granddaughters.

Carl Backstrom, Class Secretary

1934

Reunion **May 31–June 3, 1984**

1936

Ham Gurnham reports that the group of Sig Eps who started a chain letter 44 years ago are still corresponding and now meeting regularly. After 40 years of correspondence, the group met in 1980 in Williamsburg, VA; in 1981 in Bermuda; in 1982 in Myrtle Beach, SC; and in 1983 in Charleston, SC. "In June of 1985 we plan to meet in Mystic, CT, immediately following reunion weekend," he says. Included in the "Round Robin" group are **Dick Howes,** who thought up the idea in 1940, **Harry Anderson, Perry Clark, Harold Whitman, Len Humphrey, '35, Dick Merriam, '35** and **Herb Gale, '34.**

1939

Reunion **May 31–June 3, 1984**

Arthur Mallon, a retired senior staff engineer from the EPA, has received a life membership

in the National Society of Professional Engineers.

1940

Robert Hewey, a member of the Bridgeport (CT) chapter of the Service Corps of Retired Executives (SCORE), is helping to set up a SCORE walk-in branch in the Danbury area that might serve as a starter for a local chapter. He attended the Harvard Advanced Management Program and has had extensive experience in manufacturing and technical operations with the Berol Corp. in Danbury, Curtiss Wright and Singer. Before retirement he was vice president of manufacturing for the Sprague Meter Division of Textron, Inc.

1942

The Newington (CT) Town Council recently adopted a resolution honoring **E. Curtis Ambler,** who has retired from town politics. He had served 10 years on the council, 12 years on the town planning and zoning commission and 35 years with the Newington Volunteer Fire Department.

1943

In September, **Leonard Hershoff** retired from IBM in Kingston, NY, and moved from Lake Katrine to the Greenbriar I retirement development in Brick, NJ.

1944

Reunion May 31–June 3, 1984

1946

Currently, **Bernard Beisecker** is director of manufacturing for Industrial Fasteners on Long Island, NY.

1947

George Bernard, Jr., is president of Magnat Corp. of Easthampton and Florence, MA, which has developed and is marketing a newly engineered belt dewatering press called the "H_2O Express." The machine is specifically designed for removing water from any paper sludge/slurry.

1948

Allen Mintz reports that his wife, Ruby, and son, Howard, won low net and were one off for low gross (among many) at the WGAM Mother-Son Tourney held at Pembroke (MA) Country Club in August.

Romeo J. Ventres has been elected an executive vice president of Borden, as well as president of the chemical division. He also was named a member of the office of the chairman. Previously, he was a group vice president of the chemical division, responsible for adhesives, energy resources and Canadian chemical operations. Starting with the division in 1957 as a project engineer, he was subsequently advanced to general manager of thermoplastic operations and vice president of the division. Before joining Borden, he was employed as an oil-industry engineer in the Middle East and by Atlantic Refining Co. in the U.S.

1949

Reunion May 31–June 3, 1984

Elzear Lemieux, a consultant for the M.W. Kellogg Co., Houston, TX, wrote "Data for Tower Baffle Design," which appeared in the September issue of the magazine *Hydrocarbon Processing*. He started with Kellogg in 1950 and has had numerous engineering and supervisory assignments. He holds BS and MS degrees in chemical engineering from WPI and a BA from Assumption. A licensed professional engineer in New York and Texas, he is also a member of the AIChE and Sigma Xi.

Sidney Madwed is with Attitude Developers and Consultants in Bridgeport, CT.

1950

Tejinder Singh, general manager of Bharat Petroleum Corp., Ltd., Bombay, India, visited WPI last summer while on a three-month trip around the world.

1952

Dick Bennett has been named a new account executive in the Palm Beach (FL) office of Richardson Greenshields Securities, the U.S. affiliate of one of Canada's largest brokerage firms. Following a career as a civil engineer working on pipeline and turnpike construction, Dick began as an investment professional in 1966. He spent five years with the Florida firm of Alan Bush.

1953

Currently, **George Crozier** serves as director of projects and vice president of Monsanto Enviro-Chem Systems and as president of Leonard Construction Company, both wholly owned subsidiaries of Monsanto. It was incorrectly reported in the August *Journal* that he was a vice president of Monsanto.

George Saltus has been elected to the board of trustees at WPI. He is a director at AT&T Information Systems Engineering for design and development at the company's Denver (CO) laboratory. He also serves as director of the Customer Switching Laboratory. With Bell since 1953, George has been involved with the design of switching systems, satellite control and missile control systems. He holds seven patents on military computer circuits, electronic key telephone systems and Picturephone key telephone systems.

1954

Reunion May 31–June 3, 1984

Sahl Kabbani, a Saudi Arabian businessman, serves on the board of directors of a Muslim educational and religious organization, Dar al-Islam, located in Abiquiu, NM. The focal point of the 20-family colony is a mosque built of clay, mud, straw and adobe bricks, the only rural Muslim mosque in the U.S.

Following many years as president of his own firm, **Wesley Wheeler** has rejoined J.J. Henry Co., Inc., as vice president. The Henry organization is one of the world's largest firms of naval architects, marine engineers and consultants. Wheeler's most recent activities include preliminary design, plan approval, construction supervision, vessel operations and marine marketing.

1956

Robert Baer is president of M&M Services in Woodland, CO. He has his MBA from UCLA.

1958

Donald Abraham, a project engineer for Naval Underwater Systems Center in New London, CT, holds a patent on a volume reverberation profiler.

Richard Lisbon continues as director of planning at Virginia Commonwealth University in Richmond.

1959

Reunion May 31–June 3, 1984

MARRIED: Winthrop Wassenar and Kathy McNally on June 4, 1983. She is assistant professor of economics at Williams College, Williamstown, MA. Last year, he became director of the physical plant at Williams, where he's been employed for 18 years. Wassenar, who has a son and a daughter, likes golf, squash and gardening.

Bob Berg, president of Wesley Corporation, Scottdale, GA, writes that he is on three civic boards of directors. His daughter, Kimberly, graduated with high honors from WPI in June, after only three and a half years. His son, Eric, is now at Vanderbilt Graduate Divinity College.

Currently, Dr. **Dave Evensen** is head of a structural analysis section at Hughes Aircraft, El Segundo, CA. Daughter Karen is a computer scientist with Hughes in Irvine; son Craig is an electrical computer engineering major at UC, Santa Barbara; and Suzanne attends UC, Santa Cruz. His wife, Joanne, is a teacher. Last October Dave, who has taught at UCLA and USC, presented a national short course on "Applied

Structural Dynamics" in both the L.A. and Washington, DC, areas.

Bill Farnsworth continues as a plant superintendent with Du Pont in Victoria, TX. He writes, "Hobbies are golf, genealogy and raising three boys."

Kent Healy is now operating a one-man consulting office on Martha's Vineyard. He will continue developing prefabricated subsurface drains, on which he holds a joint patent with Mirafi, Inc. Previously he was a CE professor at the University of Connecticut for 19 years.

For the past four years, **Bob Hoag** has been manufacturing manager for Rosenthal Technik, Inc., Providence, RI. The product line includes technical ceramic packages and substrates for the electronics industry. The Hoags live in Attleboro, MA, and have two children. Bob says he's retired from any serious basketball but enjoys jogging and golf.

Tom Humphrey has been teaching, researching, writing and consulting with MIT's Center for Transportation Studies for nearly five years. One daughter just graduated from UMass; another graduated from the Fashion Institute of Technology in NYC and works for designer Ralph Lauren; and his son recently graduated from high school. The family likes to travel, ski and sail.

Larry Lavallee has started a new job as a principal engineer in the radar systems division of Raytheon's Equipment Development Labs in Wayland, MA. He and his family returned from Kwajalein Missile Range last summer, where he had been a radar systems engineer with the RCA missile and surface radar division. He says they will miss island life, including scuba diving, sailing, karate, etc.

Last year, **Bob Massad** traveled to West Germany and Mexico City on business. "Actually I spend a lot of time traveling throughout the U.S. and Canada, too," he says. He has been a senior product engineer for Diamond Products, Bay State Abrasives (Dresser Industries) since 1968. He says he always travels with his golf shoes!

Win Priem serves as managing director of the National Financial Services Search Division, as well as senior officer of Korn/Ferry International, New York City. Prior to joining the firm in 1976, he was regional director of the U.S. Small Business Administration for the Northeast and had been vice president in the national division of Marine Midland Bank. He has an MBA from Babson and is an alumnus of the Program for Management Development at Harvard Business School.

Currently, **Bill Saimond** is manager of logistics operations for the orbiter fuel cell power plant group at the power systems division of UTC (formerly Pratt & Whitney Aircraft). From 1969 until 1973 he was a member of the Apollo launch team in Rockwell International's fuel cell/cryogenic group. He, his wife, Theresa, and three children reside on a three-acre gentleman's farm in Collinsville, CT.

Morgan Whitney runs the Lansdale (PA) plant that is building Ford Motor Company's new vehicle video computer, EEC-IV, which has recently been featured in national advertising for the new Tempo, Topaz and Ranger. He is vice president of Ford Electronics and Refrigeration Corporation.

Geza Ziegler continues as director of manufacturing for Cognitronics Corp., Stamford, CT. Also, he is still vice president of the Long Ridge Volunteer Fire Co., as well as director of the Danbury branch of Bridgeport Engineering Institute. Besides freelance radio programming, he and his wife enjoy motorcycling. She is a development engineer at Norden Systems in Norwalk. Three of their four children are in college.

Frederick H. Lutze, Jr., Class Secretary

Burton: Cornell Engineering College Developer Retires

Last summer, Malcolm Burton, '40 ME, one of the foremost developers of the College of Engineering at Cornell University, retired as professor emeritus. He had been with the college for 37 years.

When Burton arrived at Cornell the Engineering Quad was the site of temporary barracks. "Olin Hall, where I first taught as a member of the chemical and metallurgical engineering faculty, was the only completed building of the projected modern engineering campus," he recalls.

He helped plan Bard Hall, built in 1963 to house what is now the Department of Materials Science and Engineering.

While with the college administration, Burton was head of the Division of Basic Studies. As associate dean of the college, he had special responsibility for academic affairs. He was also director of the Engineering Cooperative Program. Over the years, he shepherded the college and its students through successive changes in programs, adapting curricula to emerging needs.

His professional activities have included industrial consulting, and his publications include a textbook, *Applied Metallurgy for Engineers*.

Burton at Cornell

Burton, who holds his MS in metallurgy from MIT and taught there before going to Cornell in 1946, says of his retirement, "I want to continue to do things and look forward rather than back."

It is that spirit that has prompted Burton and his wife, Hazel, to move to a new home near their children in northern California. "I plan to build a house myself," he says.

1960

Governor Michael Dukakis of Massachusetts has appointed **Martin Beck** to the Massachusetts Hazardous Waste Advisory Committee. Beck belongs to the ACS and the American Institute of Chemical Engineers. He has been employed in various chemical engineering capacities in the state, as well as in Paris, France and Pampa, TX.

George Beebe serves as a staff engineer at MIT Lincoln Laboratory in Lexington, MA.

1961

"Rick" Duval is president of U.S. Petrocold Industrial, Inc., in Lincoln, NE. He and his wife, Colleen, have five children.

Rimas Zinas was recently named technology program manager for control systems and energy in Bethlehem Steel Corporation's steel group. Zinas, who holds two ME degrees from WPI, joined the company in 1965 after two years with the U.S. Army. Originally with the research department, he was promoted to supervisor in 1971 and in 1982 was appointed supervisor of deformation processes and applied mechanics.

1962

Bruce Simmon holds the post of director of industry development at Computer Sciences Corp. in El Segundo, CA.

1963

Stephen Kaufman is the chief executive officer at Color Technology, Inc., Westboro, MA. He and his wife, Lois, have two children and live in Sharon.

1964

Reunion **May 31–June 3, 1984**

Charles Ennis, a professor at Thames Valley State Technical College in Connecticut, has been selected to teach *Electricity I*, the first

course in an engineering-related area offered at Quinebaug Valley Community Center in Danielson. Ennis is a professional engineer and holds an MS degree from the University of Connecticut.

Carl Youngman of Newburyport, MA, has renovated his synagogue hall at his own expense as a tribute to his father, who died in July. A business consultant, Youngman is also an officer of the Doktor Pet Center Corp. and Command Performance. He graduated from Harvard Business School.

1965

Sidney Klein is vice president of sales and design for Lubin Business Interiors, Inc., New Haven, CT.

Gerald Morris has been elected a member of the board of directors of South Shore Bank. He is vice president-treasurer of the Foxboro (MA) Company. With Foxboro since 1981, he has his MBA from Harvard and is a member of the Financial Executives Institute, the Treasurers' Club of Boston and the Harvard C.S.A. Advisory Council.

1966

John Gilbert recently became quality manager of Pratt & Whitney's newest factory in Columbus, GA. He writes: "The factory will be an ultramodern facility with extensive robotics, computer controls and, we hope, a very forward-looking management." It will produce compressor airfoils and disk forgings from super alloys for company engines.

Dan Maguire has received his MBA from the University of Chicago.

Gerard Toupin has been named to the new position of director of manufacturing development of the Torrington Co. Cairo (GA) bearings plant. He had been plant manager since 1979 and joined Torrington in 1966 as a design engineer. He was instrumental in the planning and construction of the plant, guiding the onset of production as its first manufacturing manager.

1967

George Batten, Jr., executive director of West Essex Community Health Services, Inc., also serves as chairman of the board of the New Jersey Hospice Organization. George, who has a master's degree from Cornell, is a member and legislative chairman of the Home Health Agency Assembly of New Jersey. The West Caldwell civic leader is a tennis player, jogger, skier and white-water canoeist.

Joseph Cieplak, who has his MA in communications from Fairfield University, continues as director of marketing at Page-Wilson Corporation, Bridgeport, CT.

Michael Grilli holds the post of vice president at Beta Engineering, Inc., Pawtucket, RI.

Travenol Laboratories, Inc., has appointed **Nelson ("Skip") Thune** as vice president of manufacturing for its Hyland Therapeutics Division. With the firm for three and a half years, he was most recently director of manufacturing for the division.

"If a day is a week here, and a month is a day, and a year is an hour, how are they going to figure our pay?"

1968

Wayne Blanchard continues as operations controller for Johnson & Johnson in New Brunswick, NJ. He has his MBA from Illinois Benedictine College, Lisle.

Victor Calabretta, Jr., was recently promoted to vice president of C.E. Maguire, Inc., international architects/engineers, in Providence, RI. He will direct marine and port activities for the company. Since joining Maguire 11 years ago, he has been concerned with domestic and international marine and port facilities, including a large ammunition port in Guam. A skilled diver, he has made numerous underwater condition surveys. He holds a BS and an MSCE from WPI and is a registered engineer in four New England states and Louisiana. Recognized for publishing six engineering papers, in 1979 he received the Geotechnical Group Award from the Boston Society of Civil Engineers.

Jeffrey Hultman is a counsel for Great Western Savings, Northridge, CA. He has a law degree from Southwestern University, Los Angeles.

John Lunney serves as an electronics engineer with the Department of the Navy in Arlington, VA.

Richard Mayer is senior project manager for James River Corporation in South Hadley, MA. Currently, he is working on market development and business strategy for a new electrostatic film.

John Orciuch works as project manager at Digital Equipment Corp., Northboro, MA.

1969

Reunion **September 22, 1984**

Robert Balcer is a planning consultant for ARCO. He resides in Dallas, TX.

Charles Doe has been elected an assistant vice president and associate actuary at State Mutual in Worcester. With the firm since 1969, he was promoted to actuary in 1979. In 1977, he was named a fellow of the Society of Actuaries. He has a master's degree from Northeastern.

Stephen Nagy, who has his MBA from Clark

University, is now a senior sales representative for Digital in Burlington, MA.

Jim Rodier, rate research manager for Public Service of New Hampshire, spoke on "Electrical Rates of PSNH" at the September meeting of the Cheshire Accountants Association in Keene.

Our apologies to Steve **Zuckerman,** who was listed as deceased in the 1982 edition of the *WPI Alumni Directory.* Steve is now a computer consultant for Prime Computer and resides in Brookline, MA.

1970

A. Patton Abbe serves as president of Hardwood Furniture Designs, Inc., in Pompano Beach, FL.

Richard Drolet is now manager of the systems department at Valley Resources, Inc., Cumberland, RI.

Randy Sablich recently left Grumman Aerospace and is currently employed as vice president and general manager of the electromechanical systems division at ABA Industries in Largo, FL.

John Sztuka is district sales manager for Hercules, Inc., Mobile, AL. He received his MBA from Western Michigan University.

1971

MARRIED: John Niestemski to Susan Bird in Syracuse, NY, on July 2, 1983. She graduated from Syracuse University and is president of Graphic Masters, Inc., Fayetteville. John holds degrees from WPI and the University of Bridgeport and works for Genigraphics Corp. of Liverpool.

BORN: to Barbara and **Doug Michel,** a daughter, Laura, on July 4, 1983. Brother Scott is now 3. Doug owns and operates Doug Michel Construction Co., Block Island, RI. He is also a commercial fisherman.

Michael Armenia is program manager for Raytheon Co., Portsmouth, RI. Also, he is a lieutenant commander and engineering duty officer in the U.S. Naval Reserve.

Dr. **Claude Mancel** continues as manager of product coordination of packaged soap and detergent products in Europe for Procter & Gamble. He and his family reside in Belgium.

Peter Markunas has been named the first director of public works in Provincetown, MA. Previously he was a mechanical engineer with the U.S. Department of Transportation.

Formerly director of market research at State Mutual, Worcester, **Robert Mills** was recently elected vice president and associate actuary at the firm.

Dr. **Noel Totti III** is a staff pneumologist at the VA Medical Center in San Juan, PR. He and his wife, Margarita, have three children.

1972

Thomas Ball holds the post of senior consultant at Bank of America in San Francisco.

Jim Hardy is now an optical engineer at Eastman Kodak in Rochester, NY. Jim's wife, Mary, works for the Visiting Nurse Service. They have two children, Jon and Luke.

Howard Levine is affiliated with the solar energy project at Texas Instruments in Dallas. In 1982 he received his PhD in physics from Rutgers.

WPI's Own Marrying Sam!

Prof. Roger Borden, '61, of WPI's ME department, marries about 12 people each year. It's all perfectly legal, and his wife heartily approves. Prof. Borden, you see, is also an ordained Methodist minister.

"I've married several WPI students recently," he says, smiling. "Including Dick Coleman, '80 CS, and Kathryn Grider, '80 ME." Borden has also performed wedding ceremonies for Anita Draghetti and Leon Droby, '82 ME, and Jean Martin, '81, and Tom Daniels, '80 ME.

It is evident that Borden enjoys his students, whether he is teaching them or marrying them. He also counsels them. Currently chairman of the Committee on Student Advising, he says, "I believe student counseling should be one of the prime concerns on campus. These are difficult times for young people."

Borden has long been interested in counseling and in the pastoral ministry. Early on, he was a lay pastor for several churches in the Worcester area. Currently, he is part-time pastor for the East Templeton Church.

His area of professional expertise includes internal combustion engines, exhaust emissions and electric vehicles. Two years ago he was selected to participate in a year-long Department of Transportation program on Automotive Emissions and Economy in Cambridge.

Professor Roger Borden with the "Formula Racer Design," the MPQ of Martin Riccirelli, '83.

Borden and his wife, Connie, a secretary at Holy Cross, have a son, Andrew, '82 MGE, who is an industrial engineer at George Frost Company in Shirley, MA. Their daughter, Meredith, a junior at New England Conservatory of Music, performed as a singer-dancer at Busch Gardens in Williamsburg last summer.

1973

Ben Allen, who received his MS in ocean engineering from URI in 1982, is currently a senior engineer at Teledyne's Brewer Engineering Labs in Marion, MA.

Michael Gipps serves as senior production engineer at Dow Chemical Co., Pittsburg, CA.

Dr. **Gerald Izzi** is a physician in the department of internal medicine at the University of Cincinnati Medical Center. His MD is from George Washington University.

Richard Nabb now holds the position of plant manager at Clairol, Inc., in Camarillo, CA.

Michael Peterson has been named consumer services representative in North Adams by Massachusetts Electric Co. He has been with the utility since 1980. Before assuming his new duties, he was an analyst for New England Power Service Co., Westboro. He has an MBA from Anna Maria College.

Dr. **C. Stephen Szlatenyi,** who has his MD from Albany Medical College of Union University, is a physician at Rhode Island Hospital in Providence.

Angelo Tsefrekas was recently elected president of the George Jarvis Chapter No. 80 of the Order of Ahepa. He is president of Delta Associates Realty, Worcester.

Michael Varga is an engineering supervisor at Barden Corp., Danbury, CT.

Robert Zawada, associate actuary for Sun Life of Canada, Wellesley Hills, MA, has been designated a certified employee benefit specialist (CEBS) by the International Foundation of Employee Benefit Plans and the Wharton School of the University of Pennsylvania. He qualified for the designation by passing ten college-level national examinations on employee benefits subjects.

1974

Reunion **September 22, 1984**

MARRIED: John Palitsch and Mary Beth Czubrynski in Worcester on May 29, 1983. A Becker graduate, she is a physical therapist at Worcester City Hospital. John is with Wyman-Gordon Co., North Grafton, MA.

BORN: to Mr. and Mrs. **Lawrence Martiniano** a son, Mark Alan, on May 22, 1983.

Dennis Rock, a musician and former audio faculty member of the Berklee School of Music, teaches a hands-on-course entitled *Recording Engineer Workshop* at MCM Recording/ Video Services, Worcester's only professional recording studio.

Dean Stratouly is vice president of the Congress Group in Boston, MA. He has his MA in business management from Central Michigan University.

1975

MARRIED: Mark Allen and Beth Ann Nygren in New Britain, CT, on July 23, 1983. She graduated from Southern Connecticut State University with both a bachelor's and a master's degree and teaches at the Wheeler Clinic, Plainville. He is employed as a project manager for Morganti, Inc., Ridgefield. . . . **David Huff** and Lisa Walters in Cocoa Beach, FL, on September 16, 1983. Lisa graduated from the University of Georgia and is business manager of Cocoa Beach Broadcasting, Inc. David serves as a safety engineer with Eastern Space and Missile Center at Patrick AFB. . . . **Peter Joyce** to Mary Beth McInerney in Madison, CT, on September 3, 1983. She graduated from Albright College, Reading, PA. He owns Connecticut Suzuki in Wallingford, CT.

Currently, **Alan Bergstrom** is a staff biochemist for Merck, Sharp & Dohme Research Laboratories, the pharmaceutical research wing of Merck & Co. in Rahway, NJ. He, his wife, and two children reside in South Plainfield.

Richard Bloom, president of Independent Glass, has been selected for a three-year term on the board of directors of the Rhode Island Better Business Bureau in Providence. With the glass company since 1975, he was elected president in 1981.

Richard Caruso is now a process engineer at HRI, Inc., Gibbsboro, NJ.

Michael DiMascio continues as an associate in Firepro, Inc., Wellesley Hills, MA.

Denise Gorski, an industrial engineer for IBM, spent several weeks last spring in Japan at an IBM worldwide manufacturing review. On her return trip, she enjoyed a few days in Hawaii. Denise serves on the board of directors for her townhouse complex and takes evening courses.

The FIP Corporation has promoted **David Shopis** to vice president of construction. Formerly he was manager of project operations for the firm. He attended Virginia Polytechnic Institute and received an MS degree in building science from RPI.

Frank Sundermeyer is now vice president of engineering for Electronic Solutions, Inc., Watertown, CT.

Patricia Graham Flaherty, Class President

1976

MARRIED: Brian Swanson and Ruth Rowan in Grafton, MA, on August 27, 1983. Ruth graduated from Oberlin (OH) College and MIT and is a product manager at Norton Co., Worcester. Brian is a senior research engineer at Norton. . . . **Steven Tuckerman** to Dr. Krystyna DeLuca in Brookline, MA, on August 20, 1983. She graduated from Liverpool University Medical School. He has a master's degree from UMass, Amherst, and is a town planner for East Hampton, CT. . . . **Thomas Zarrilli** and Suzanne Kaminsky in Philadelphia, PA, on October 1, 1983. Suzanne, a graduate of Moore College of Art, is import manager at Ellen Tracy, a women's sportswear company. Tom has his MBA from the Wharton School of the University of Pennsylvania and is vice president of Sonnenblick Goldman, a national real estate firm.

Norman Gariepy has been elected a fellow of the Massachusetts Society of Certified Public Accountants, Inc. Currently he is in practice as principal with his office in Fitchburg, MA. He received an MS in accounting from Northeastern University.

Paul Grogan, who has his MS from Carnegie-Mellon University, is a teaching assistant at WPI.

Diane Gunn serves as construction engineer for the Smithsonian Institution in Washington, DC.

Formerly with Arthur Andersen, **Jim Hall** is now an associate in management systems support for Index Consulting.

Raymond Mandeville serves as a senior analysis engineer at ITT Grinnell Corp., Providence, RI.

Charles ("Rick") Robinson, senior quality engineer at Micro-Switch of Marlborough, MA, has been elected to the ESNE executive committee. He graduated with his BSEE from Tufts and his MS in management science from WPI. A certified quality engineer, he is a former treasurer of the Worcester section of the American Society for Quality Control.

Robert Roy IV is a project supervisor for GTE-Sylvania in Needham Heights, MA.

1977

MARRIED: Richard Seidnitzer and Anita Lacaprucia in Springfield, MA, on September 23, 1983. Anita is a nutrition major at Holyoke Community College. Richard is a construction engineer.

In September, **Adolfo Chandeck** began a 12-month assignment at IBM's European marketing support center in Greenford, England.

Bill Cloutier is a senior engineer for Yankee Atomic in Framingham, MA. He and his wife, Ellen, have two children and reside in Hopkinton.

W. Paul Cullen is a partner in Applied Robotics, which celebrated its first birthday this January. The firm is located in Troy, NY, and designs "hands" and "brains" for robots used in manufacturing.

John Pappas, superintendent for Perini Corp. of Framingham, MA, writes, "Our current project is Harrah's Boardwalk Hotel and Casino in Atlantic City, NJ."

Robert Wyman, a project manager for Whitman & Howard's, Inc., Wellesley, MA, has been elected an assistant vice president of the consulting-engineering firm. He is responsible for water-system studies and long-range planning, the development of groundwater supplies and the design and supervision of water-main improvements. He has an MSCE from WPI.

1978

MARRIED: David Balukonis and Cynthia Kittredge on June 11, 1983, in Clinton, MA. A financial-assistance worker for the State Department of Public Welfare, Cynthia graduated from Worcester State and attended Southeastern Massachusetts University. David, who attended UMass as well as WPI, is assistant manager for Strand's Ski Shop, Worcester. . . . **Thomas Edwards** and Mary Ann Matt in Lee Center, NY, on September 10, 1983. Mary Ann is a student at Utica College of Syracuse University. Both she and Tom are employed by PAR Technology Corp., New Hartford, NY.

MARRIED: Kevin McNamara and Mary Kruczynski in Worcester on May 21, 1983. Mary graduated from Holy Name High School and is an administrative secretary at Shawmut Worcester County Bank. Kevin is employed as a mechanical engineer by Boston Edison Co. . . . **James ("Demetri") Shuris** and Kathleen Leone in Marlborough, MA, on October 2, 1983. Kathy graduated from Framingham State College and is employed as an office manager at Medical Resources, Framingham, MA. Demetri is a construction project engineer at Riley Stoker Corporation, Worcester, and is a registered professional engineer in Massachusetts. . . . **Stephen Superson** and Sharon Mulcahy in Montville, CT, on October 8, 1983. Sharon graduated from Windham Dental Assistant School. Stephen is a design engineer at Teledyne Engineering Services Corp., Waltham, MA.

Raymond Beauvais, who has a BS in chemistry from Southeastern Massachusetts Technological Institute, is a teacher in Attleboro, MA. He and his wife, Sandra, have two children.

Wayne Beisecker, who is now with Ciba Geigy, Cranston, RI, is "glad to be back on the East Coast to pursue my favorite hobby, fishing." He and his wife, Kim, have two daughters, whose grandfather is **Bernard Beisecker, '46.**

Capt. **William Diederich** serves in acquisitions for the USAF at the Naval Systems Command in Arlington, VA.

Dr. **Raymond Dunn** is a surgery resident at the University of Massachusetts Medical Center in Worcester. He has his MD from Albany Medical College.

Mark Etre has been promoted to engineer at Northeast Utilities, Hartford, CT. He joined the firm in 1981 as an associate engineer. Currently, he is studying for his MSME at Hartford Graduate Center. The Etres have a son, Matthew, and a daughter, Kathryn.

Robert Flynn owns Bob Flynn Associates in Bloomfield, CT. He received his MBA from Babson.

John Holland is a senior engineer with Northern Research & Engineering, Woburn, MA.

Dr. **Peter Johnson** is a physician at Newton-Wellesley Hospital in Newton Lower Falls, MA. He received his MD from the University of Massachusetts Medical School.

Benjamin Khoudari serves as general manager of the family business in Bogota, Colombia. He and his wife, Jacqueline, have two children.

Osamu Kimura is a scheduling engineer for Fay, Spofford & Thorndike, Inc., Boston.

Gary Krumpholz is a staff member at MIT's

Lincoln Laboratory in Lexington, MA.

Francis Leahy III is studying for his MSEE at the University of California at Davis.

James Monroe serves as a research assistant at the University of Massachusetts Medical School in Worcester.

Sergej Ochrimenko continues as a field engineer for Raymond International, Rochelle Park, NJ.

Joseph Orlando is a senior engineer for Bunker Ramo in Trumbull, CT.

Bob Raslavsky is currently a self-employed photographer, photo-finisher and sales representative in Worcester.

Jeffrey Wetmore is a structural engineer at Edwards & Kelcey, Inc., Minneapolis, MN.

Randall Wyatt is a high voltage DC project engineer for GE in King of Prussia, PA.

1979

Reunion **September 22, 1984**

MARRIED: Martin Paglione and Lynn Stochaj on May 7, 1983, in Worcester. Lynn graduated from Assumption College and is employed by Pronuptia de Paris Bridals. Martin, who holds degrees from WPI and UMass, Amherst, is a computer programmer analyst for Tile Composition, Inc., Chicopee, MA. . . . **Phillip Roux** to Karen Powell on September 17, 1983, in New Britain, CT. A graduate of Southington High School, Karen is a secretary at the University of Connecticut Health Center in Farmington. Phillip works for Data General in Westboro, MA. . . . **Joseph Spinn** and Lynda Mullen on September 10, 1983. Lynda is a registered nurse. Spinn has been working for the rocket performance group at Pratt & Whitney Aircraft in Florida. . . . **William Winters** and Barbara Price recently in Quincy, MA. She graduated from Quincy Junior College, and he is a civil engineer with the U.S. Geological Survey, Palo Alto, CA. He holds an MSCE from Cornell.

BORN: to Sharon and **Michael Gallerani** their first child, Catherine Mary, on June 13, 1983. Mike is a manufacturing specialist with the lighting systems department of GE. The Galleranis reside in Hendersonville, NC.

Stephen Falls is an R&D supervisor at the Spencer Turbine Co., Windsor, CT.

Eugenia Fernandez is currently attending the School of Management at Purdue University, where she is studying for a PhD in management information systems. She has received an IBM fellowship for the first year.

Scott Hansen has been promoted to senior engineer at Monsanto's Technical Center in Decatur, AL. With the firm since 1979, he is currently a member of the Acrilan research and development department. He is treasurer of the Decatur chapter of the AIChE and has served as an advisor for Junior Achievement.

Ronald Knapp is a senior design engineer with Advanced Micro Devices in Sunnyvale, CA.

Danny Lee works for Eastman Kodak in Rochester, NY.

Steven Mandell is a scientific programmer in the county engineer's office in West Palm Beach, FL.

Last May, **John Meader** received the "Young Engineer of the Year" award from the George Washington chapter of the Virginia Society of Professional Engineers, an affiliate of the National Society of Professional Engineers (NSPE).

"In the beginning, Biophase Genetics, Inc. created us."

Dan Pouliot is manager of switched services at New England Telephone in Burlington, VT.

Sandra Dorr Wilson serves as account system engineer for Information System Services-IBM in Waltham, MA. She was promoted from programmer/analyst to account system engineer last July.

1980

MARRIED: Stephen Hansen and Maria De Los Angeles Wagner in Nogales, AZ, on September 3, 1983. Maria graduated from Nogales High School. Stephen is employed at Chamberlain Manufacturing Corporation. . . . **Richard Hennessy** and Karen Timmons recently in Melrose, MA. A nurse at the Children's Hospital Medical Center, Boston, Karen received her BS in nursing from Boston College. Richard works for Brown and Sharpe Manufacturing Co., West Kingston, RI. . . . **Steven Kahn** to Mary Donatelli in Pittsburgh on August 25, 1983. Mary, a nurse in the intensive care unit at Montefiore Hospital, graduated from Duquesne University School of Nursing. Steve is with Westinghouse Bettis Laboratories, Pittsburgh. . . . **John O'Horo** and Kristine Scherzinger recently in Clifton Park, NY. Kristine graduated from the University of Notre Dame and the GE Financial Management program. John is a management engineer at GE in Wisconsin.

MARRIED: Mark Riley and Sharon Brierly in Milford, NH, on October 8, 1983. She graduated from San Jose State University in San Jose, CA. They are both employed at Digital Equipment in Merrimack, NH. . . . **Edward Szkutak, Jr.,** and **Paula Mesite** on October 1, 1983, in Framingham, MA. They are both candidates for master's degrees: she from MIT and he from the University of North Carolina at Chapel Hill. . . . **Scott Yeomans** and Rosemary DeForge in Andover, CT, on October 8, 1983. She graduated from Bloomfield High School and is a secretary at the Travelers Insurance Co., Hartford, where he is a research analyst.

Douglas Armstrong, a researcher for Johnson & Johnson Orthopaedics in Braintree, MA, is concerned with materials and product research for implantable total-joint replacements.

David Aspinwall is a self-employed general contractor and builder in Millbury, MA.

Rex Chen works as a senior software engineer for Digital Equipment Corporation.

David Clarke is a part-time student at Bob Jones University and is also concerned part time with contracts for software development.

Donald Connor is a graduate student in the neurosciences at the University of Alabama in Birmingham. In 1982 he received his MS in neurochemistry from the University of Connecticut.

R. Barrie Etherington works as a process engineer for GE in Rutland, VT.

John Fazio is with Du Pont in Aiken, SC.

John Forrester, on temporary assignment in West Virginia since 1982, is an electrical field engineer for Stone & Webster in Boston.

Alan Freeman works for Fenwal, Inc., in Ashland, MA. He and his wife, Merilee, have one child.

Jim Getches is now with Triple-S Plastics in Kalamazoo, MI.

George Gikas is a project engineer for Aster Engineering Corp. in Middleton, MA. He has

his MS in metallurgy from the University of Connecticut.

Michael Kennedy now serves as a plant safety engineer for Conoco Chemicals Co. at the Chocolate Bayou plant near Alvin, TX.

Serge Molinari continues as a services engineer at Du Pont in Beaumont, TX.

Michael Ramadei is an electrical engineer for Philips Medical Systems, Inc., in Shelton, CT. Last year he received his MBA from Rivier College, Nashua, NH.

John Rust serves as a management trainee at Warren Pumps in Warren, MA. He holds a BA from Bridgewater State College.

Thomas Ryan, who has a master's in natural science and a BA in biology from Salem State College, is a teacher in the Wakefield (MA) public school system.

Paul Staehly is an associate engineer for Northeast Utilities in Middletown, CT.

William Taber works as a process engineer at Raytheon in Quincy, MA. He and his wife, Margaret, reside in Rockland.

Daniel Tarkiainen is a math teacher at Wachusett Regional High School in Holden, MA.

Lt. **Thomas Trepanier** serves as a reactor training officer with the U.S. Navy aboard the *USS Carolina.*

Scott Wade, who is currently working for his MBA at Drexel University, is an engineer with Philadelphia Electric Co.

Francis Walsh serves as a group leader in process engineering at W.R. Grace & Co., Lexington, MA.

1981

MARRIED: Wayne Barry to Sharon Eid on September 18, 1983, in Worcester. Sharon, a management trainee at Shawmut Worcester County Bank, graduated from Skidmore College. Wayne is employed by Largo Corp. and is studying for his master's degree at Assumption. . . . **Daniel D'Amore** and Debra Souza in Clinton, MA, on June 25, 1983. A floral designer and graduate of Ritter School for Floral Design in Boston, Debra currently attends evening classes at Fitchburg State College. D'Amore teaches at Nashoba Regional High School. . . . **Thomas Hryniewicz** to Lori Ann Chiasson in Worcester on September 10, 1983. A graduate of Assumption, Lori is studying for her master's degree at the University of Connecticut School of Social Work, West Hartford, CT. Tom is a demographic analyst and computer programmer for Donnelly Marketing Information Services, Stamford.

MARRIED: Kurt Ross and Darlene Butler on October 22, 1983, in Sudbury, MA. She graduated from Dean Junior College and is a senior secretary for Prime Computer, Framingham. He serves as an applications engineer with Applicon in Burlington. . . . **Michael Schmerbeck** and Phyllis Rogers recently in Newton Centre, MA. Phyllis graduated from Saint Vincent Hospital School of Nursing, Worcester. A structural design engineer, Michael works for U.S. Steel in Pennsylvania. . . . **James Thurber** and Kathy Signorielli in Norton, MA, on August 13, 1983. Kathy is a graduate of Assumption College.

Arthur Bainton is a test systems programmer at GenRad in Waltham, MA.

Ben Barber works as a design engineer at Texas Instruments in Attleboro, MA.

David Briggs works for Codex Corporation, Mansfield, MA. He resides in Norwood.

Tony Cabral, who recently received his master's in metallurgy from Carnegie-Mellon, is now a metallurgical engineer at Pratt & Whitney Aircraft in East Hartford, CT.

Edward Crivello serves as a chemical engineer at the U.S. Army R&D Center in Natick, MA.

Eric Cunningham is currently engaged in developing a business to provide office space and prototype development services to engineers, technical sales representatives, architects and advertising firms. He is seeking partners in this venture, which will be located in the Boston area. The company name is Shared Resources, and the address is: P.O. Box #1381, Boston, MA 02205.

Dr. **Stephen Dellaporta** is currently working at Cold Spring Harbor (NY) Laboratory for the 1983 Nobel Prize winner in physiology and medicine, Dr. Barbara McClintock. She received the award for her work on transposable elements (jumping genes) in maize (corn). Through their efforts, ways may be found to genetically engineer corn to improve world food production.

Jeff Dick was recently named a senior electro-optic engineer in the engineering area of the Telecommunications Products Division of Corning Glass, Corning, NY.

John Farnsworth is a sanitary engineer with John A. Farnsworth in Lancaster, MA. Currently, he is a teaching assistant and full-time graduate student at WPI.

Thomas Finn is employed in the civil and marine division of C.E. Maguire, Inc., Providence, RI. He is also studying for his MBA at Bryant College.

James Geib now serves as a design engineer at Augat, Inc., Attleboro, MA.

Walking His Way To The Olympic Trials?

Brian Savilonis, '72, assistant professor of mechanical engineering at WPI, may well walk his way into the Olympic trials this year. He's got a good start. At 33, he's already a national-caliber race walker.

Last fall, he won his first ultra-distance race, the National 100 Kilometer Race-walking Championship in Arlington, VA. He topped a field of 25 in the 62.2-mile track race with a time of 10:33:12. Unofficially, this is the third fastest time ever by an American.

He also won the New England Championships at 30KM and placed second at 20KM and 5KM. He finished fifth at 50KM in the National Sports Festival at Colorado Springs last summer. In May, he placed 13th at the nationals in Monterey, CA, at 50KM.

Since taking up race walking seven years ago, Brian, formerly a dedicated runner, has not suffered a single injury, and rarely an ache or a pain. He became interested in the sport when he was a research scientist in Virginia.

Currently, race walking is popular mostly outside the U.S., with the stars coming from Mexico and Europe, but this does not deter Brian. "I have trouble finding someone to train with," he admits. "Sometimes I have to walk beside the slower runners."

He has made at least one dedicated convert: his wife. "Jan is a national certified race-walking judge," he reports. "But she doesn't show one bit of favoritism. She's given me more cautions than any other judge!"

Last year, Brian won a Teetor Award from the Society of Automotive Engineers for his technical work in the energy field. Previously, he was an assistant professor

Professor Brian Savilonis, '72 ME: A stroll to the L.A. Coliseum?

at the Center of Engineering, Widener College, Chester, PA, and a senior research scientist at the University of Virginia. He has an MSME from WPI and a PhD from SUNY-Buffalo.

Today, race walking takes up much of his "leisure" time. It's not an easy sport. It requires lots of upper-body strength and a technique that takes years to perfect. "People think it's a funny waddle. They don't appreciate the effort that goes into it. They think anyone can walk," Brian says.

True. Nearly everyone can walk, but few can walk like Brian Savilonis. And even fewer are saying they might have a shot at the Olympic trials.

Joseph Gionfriddo holds the post of manager at Procter & Gamble's Winton Hill Technical Center in Cincinnati, OH.

Gregory Glod is a professional development program associate with Colt Firearms in Hartford, CT.

Paul Goldense holds the post of assistant superintendent at Perini Corp., Cambridge, MA.

Richard Halleck was recently promoted to associate engineer at Northeast Utilities. He joined the firm in 1981 as an assistant engineer in the generation electrical engineering department.

Lee Hevey is now an applications engineer for Corning Glass Works Telecommunications Products Division, Corning, NY.

David Jensen serves as a B-52 pilot for the USAF at Andersen AFB, Guam.

Jeffrey Labuz, a graduate student in the EE department at the University of Virginia in Charlottesville, is working for his PhD and specializing in image processing.

Thomas Lepore has been promoted to senior vice president of Della Construction Co., Inc., Enfield, CT. Formerly a professor of civil engineering at the University of Hartford, he holds degrees from the University of Hartford College of Engineering and WPI. He joined Della in 1981 as vice president of engineering.

James Morgan is a computer scientist for D&D Computer Security Center at Ft. Meade, MD.

Dennis Moulton works for Stone & Webster. He resides in New London, CT.

Dung Nguyen is manager of the plating department at Diamond Machining in Marlboro, MA. He has his MS from WPI.

Augustus Nunes, Jr., is a design engineer for Analog Devices, Inc., Norwood, MA.

Rick Rykosky currently works in design, project management and field supervising for the Gatx Terminals Corp. bulk liquid storage terminal in Good Hope, LA.

Chandran Santanam serves as a senior engineer at Riley Stoker Corp., Worcester.

Gilbert Stiles, Jr., holds the post of president at New England Test Systems, Westboro, MA.

Kristi Thompson, a chemistry teacher at Shepherd Regional High School, Dudley, MA, is working for her master's of education through UMass, Amherst.

Marc Trudeau is an acoustical engineer at Epicure Products, Inc., Newburyport, MA. He is studying for his MSEE at the University of Lowell.

David White is an electrical engineer at Combustion Engineering, Windsor, CT. Currently, he is studying for his MSEM at Western New England College.

1982

MARRIED: Robert Bean to Karen Rombousek on July 16, 1983, in Worcester. Karen is a senior at Worcester State College. Robert is a graduate student at WPI. . . . **Jane Bulejcik** and Ralph Becker in Webster, MA, on August 6, 1983. Jane is an electrical engineer with EVA Service Corp., Lincoln, RI. Ralph is a software engineer with Prime Computer, Framingham, MA. . . . **Brian Dunne** and Mary-Ellen McLaughlin in Worcester on June 26, 1983. Mary-Ellen graduated from Becker Junior College and Fitchburg State College. Brian works for Westinghouse Corp., Baltimore, MD. . . . **Robert Finnance** and Beth Monde on September 16, 1983, in Middletown, CT. Beth graduated from Endicott College. Robert, an engineer with GTE Corporation, Needham, MA, is also doing graduate work at Babson College. . . . **Gary Johnson** to Jo-Ann Lane in Reading, MA, on August 27, 1983. A registered nurse, she graduated from Peter Bent Brigham School of Nursing. He is a naval flight officer stationed in San Diego, CA.

MARRIED: David Leeman and Carolyn Humfryes in Worcester on May 21, 1983. A medical secretary, she attended Quinsigamond Community College and Worcester State Col-

Living in Class!

Anyone who questions the value of the WPI Plan should talk with Paul Varadian, '75. Varadian, an honors graduate and recipient of the Carl F. Meyer Civil Engineering Award, is president of Trans-Continental Development Corp., a multimillion-dollar real-estate conglomerate based in Boston. One of Varadian's development projects has brought him back closer to WPI than he ever thought possible. Within 100 yards of Kaven Hall and across the street from the Worcester Art Museum, TransContinental has just finished converting Worcester's former North High School complex into a $7-million luxury condominium development.

Varadian sees a direct link between his current ventures and the WPI Plan. "I was fortunate to have the opportunity to do one of the first large-scale MQPs on the construction of a major addition to the Burbank Hospital in Fitchburg, under the direction of Professor A. Fattah Chalabi. Now we've just finished developing one of the largest, private real estate projects undertaken in Worcester at the very doorstep of the WPI campus."

North High Gardens has been a national success story. Varadian structured an investment plan, now widely copied, by which an investment condo buyer could take advantage of a 25 percent investment tax credit, offered on certified historic rehabilitation projects, like North High Gardens. On a $100,000 unit, a $10,000 down payment, with a resulting $25,000 tax credit, shows obvious appeal. A buyer then rents out the unit to meet the mortgage payments, with substantial profit coming upon sale five years later. And with a large four-story garden atrium, glass elevators, large units and ornate details, tenants truly "live in class."

Paul Varadian in the atrium

Varadian is an active director of the WPI Boston Alumni Association. He is also a founding director of the Summit Group, a well-known Boston financial and tax-planning firm, as well as a founding director of RETEC Associates, a real-estate consulting firm which serves Fortune 500 companies under the direction of another WPI alumnus, Peter Walworth, '74.

lege. He is with Hydronic Technology, Inc., Shrewsbury. . . . **Thomas Marnik** to Kathleen Correia in Fairhaven, MA, on September 17, 1983. A registered nurse, Kathleen graduated from Rhode Island College. Tom is a general contractor for Marnik's Construction. . . . **Cyril Marrion, Jr.,** and **Kathleen Pereira** were married on August 27, 1983, in Cumberland, RI. Kathleen is a mechanical engineer at Raytheon in Wayland, MA, and Marrion is an electrical engineer at Digital in Maynard. . . . **John Scoville** and Christine Bruciati in Middletown, CT, on September 10, 1983. Christine graduated from Becker. John is with GE in Cincinnati, OH. . . . **Scott Traynor** and Leslie Cornwall in Wethersfield, CT, on August 20, 1983. Leslie is a draftsman at Consultants and Designers, East Hartford. Scott is a mechanical engineer with Naval Underwater Systems Center, New London.

Gary Adams serves as a research assistant in the department of polymer science at the University of Massachusetts in Amherst.

Robert Addiss works for Transkinetics in Canton, MA.

Joyce Trela Auman was recently promoted to experimental engineer in the Hamilton Standard Division of United Technologies in Windsor Locks, CT.

Michael Bagley is a software engineer for Intelligent Business Systems in Saco, ME.

Alan Bardsley teaches physics in Seekonk, MA. He has a BS from Rhode Island College.

George Beauchesne is employed as a field engineer at Eaton Corp., AIL Division, Edwards, CA.

Dale Beaver serves as a design engineer at Innovative Products & Equipment in Lowell, MA.

John Bellantoni is a microwave component design engineer at Alpha Industries in Lawrence, MA.

Richard Bolstridge works as a software product specialist at Applicon, Inc., Burlington, MA.

David Carlson is a diagnostic programmer at Computervision Corp., Bedford, MA.

Paul Cottle is in the physics PhD program at Yale.

Donald Cowles, Jr., serves as a process engineer at GTE Sylvania in Needham, MA.

Brian Dalton works as a field engineer and assistant superintendent for Turner Construction Co. He is now located at Virginia Beach, VA.

Martin DeLuca is employed as a checker and supervisor at Pepsi-Cola New York Bottling, Long Island City, NY.

Harold Dickerman holds the post of product manager at Professional Software, Needham, MA.

Michael Donati is an applications engineer at Beswick Engineering Co., Inc., Ipswich, MA.

Toma Duhani works as a project engineer for the Department of Transportation in Providence, RI.

Matthew Flynn is a medicinal chemist at American Hoechst.

Ralph Gifford III is now a sales engineer for Dana Corp., Auburn, MA.

Jeff Gross has been promoted to products line engineer at the Hawthorne Farms facility of Intel Corp. in Hillsboro, OR. Previously he was with Intel in Chandler, AZ.

Stefan Hagopian is a full-time student at the University of New England College of Osteopathic Medicine in Biddeford, ME.

Cheryl Hamer does research at Dana Farber Cancer Institute, Boston.

Daniel Head is a start-up nuclear engineer for Westinghouse in Fulton, MO. He and his wife, Xavier, have one child and live in Jefferson City.

Constance Heath is studying for her MBA at Clark University, Worcester.

Frederick Klich is employed as a design engineer at GE in Pittsfield, MA. Currently, he is studying for his master's in engineering at RPI.

Kevin Ladd works for Digital in Littleton, MA.

Ruth Lapan teaches chemistry at Rivier College, Nashua, NH. She has a BS from Trinity College, Burlington, VT, and an MEd from Keene State, Keene, NH.

Christopher Lord serves as an electrical design engineer at H.F. Henderson Industries, West Caldwell, NJ.

Richard Mallia is a programmer and instructor at Business Computer Systems, Newington, CT. He resides in Plainville.

Richard Masse is studying for his MSCE at UMass, Amherst.

John Mastroianni, who holds a BSEE from the University of New Haven and an associate's degree from Waterbury State Technical College, serves as a senior design engineer at Prime Computer, Inc., Framingham, MA.

Currently, **John McManus** is a process analyst for Pratt & Whitney Aircraft, East Hartford, CT.

Caryn Mee holds the post of research chemical engineer at the Army Materials and Mechanics Research Center in Watertown, MA.

Gary Oja is a systems programmer for AFI-Datatrol, Hudson, MA.

Joel Patenaude is serving with the Peace Corps in Kenya.

Wilson Powell holds the post of manager of computer-aided design at Sunsearch, Inc., Guilford, CT.

Robert Raymond is plant manager at J.F. Donovan, Inc., Providence, RI. He and his wife, Ann, have two children.

Carl Rice works as a senior mechanical engineer for Gould's Modicon Division in Andover, MA.

David Rubinstein is a consultant at Arthur Andersen & Co., Boston.

Wayne Saari currently works as a software engineer at Bendix Grinding Machine in Worcester.

Peter Saloman is a software engineer at Wang Laboratories, Lowell, MA.

Kenneth Scott is chairman of the computer and business department at St. Peter-Marian High School in Worcester.

Douglas Sieber holds the post of plant engineer at Haartz Auto Fabric Company, Acton, MA.

Glen Stimson is an electrical engineer for Raytheon, Wayland, MA. He and his wife, Deborah, reside in Marlboro.

Christopher Trolle is a mechanical engineer intern at Omega Engineering, Stamford, CT.

1983

MARRIED: Stephen Beaudoin to Marsha Gallup in West Brewster, MA, on September 17, 1983. Marsha graduated from UConn and is a clinical dietitian at Morton Hospital in Taunton. Stephen is with the U.S. Army Research and Development Laboratory in Natick. . . . **Mark Boivin** and **Fern Amuan** on September 24, 1983, in Groton, CT. She is with the Naval Underwater Systems Center in New London and he serves as supervisor of chemical processes at Yardney's Battery Division in Pawcatuck. . . . **Sean Cafferty** and Sharon Casson on September 24, 1983, in Clinton, MA. . . . **Donna Fitzback** and Randy Becker in Webster, MA, on June 25, 1983. Donna is a programmer at the Commerce Insurance Company in Webster. Randy is an accountant at Arthur Young and Company. Both graduated from Nichols College.

MARRIED: James Houskeeper to Lynn Blevins in Enfield, CT, on June 25, 1983. He is a mechanical engineer for United Oil Products in Bantam. . . . **Steven Kelley** and Susan Knipe in Shrewsbury, MA, on June 19, 1983. Susan, a calculation specialist for State Mutual in Dallas, TX, graduated from Quinsigamond Community College, Worcester. Steven is an electrical engineer with Texas Instruments, Dallas. . . . **Nelson Martel, Jr.,** and Elaine Racicot on August 13, 1983, in Agawam, MA. She attended UMass, Amherst. He works at IBM in Rochester, MN. . . . **William McMullan, Jr.,** to Nancy Gallant in Manchester, CT, on August 20, 1983. Nancy, who attended Our Lady of the Elms College, graduated from Worcester State College. McMullan is attending RPI's Center for Electric Power Engineering in Troy, NY. He has been employed as a transmission and distribution planning engineer at Commonwealth Electric Co. in Wareham.

MARRIED: Peter Mott, Jr., and **Stacey Bullock, '82,** on September 10, 1983, in Canton Center, CT. Peter is a software support specialist at Digital in Marlboro, MA. . . . **Richard Tolles** and Nancy Ortman in Middlebury, CT, on September 24, 1983. Nancy attended Worcester State College and was formerly with Shawmut Worcester County Bank. Richard is a computer engineer for MicroWare, Inc., of Kingston, MA. . . . **Kenneth Webber** and **Dale DeLibero** on August 13, 1983, in Trumbull, CT. Dale is a programmer/analyst for Texas Instruments in Attleboro, MA, and Kenneth serves as a mechanical engineer at Digital Equipment Corp., Tewksbury. . . . **Nancy Wilkinson** and Michael Lincoln in Plainville, MA, on September 3, 1983. Nancy, a software engineer, is with Sanders Associates in Merrimack, NH. Michael graduated from King Philip Regional High School and is employed in the quality assurance department at Metaloy, Inc., Wrentham.

Sonia Adrianowycz has been employed by the Naval Electronic Systems Command in Washington, DC.

Patricia Allard is with GE-Medical in Milwaukee, WI.

Yuly Aronson is a junior engineer for the New York State Department of Transportation.

Donna Bagdonovich has joined Amicon Corporation in Lexington, MA.

Mark Besse works as a programmer at Harris Corp., Rochester, NY.

Ruth Bibbo has joined GE in Evendale, OH.

Joseph Boggio is now a field engineering representative with GE in Pittsfield, MA.

Robert Bors is with the Peace Corps in the Philippines.

Steven Burns works for Raytheon in Wayland, MA. He, his wife, Donna, and their child reside in Ashland.

Robert Bursiewicz is with Condiesel Mobile Equipment Corp., Schenectady, NY.

Renee Cardinal is a member of the technical staff at Hughes Aircraft Co. in Fullerton, CA.

Alan Carpenter serves as a civil engineering assistant for the County of Los Angeles in California.

Kevin Cavanaugh has joined the USN Underwater Systems Center, New London, CT, where he is an electronics engineer.

Edward Clancy works as a design engineer for GE in Wilmington, MA.

Dave Coleman is an associate software specialist at Digital Equipment Corp., Marlboro, MA.

Francis Connolly works for GTE in Westboro, MA.

Michael Connors is a manufacturing engineer at Torrington (CT) Co.

James Coyne is now an associate engineer at AVCO Systems Division in Wilmington, MA.

Gary Cromack of Greenfield, MA, is a self-employed consulting engineer.

Sujal Dave works as a software engineer for DEC in Andover, MA.

Richard Dietz works for Digital Equipment Co., Maynard, MA.

Peter DiMarco continues as a science teacher at Franklin (MA) High School.

Christopher Duggan is employed at GTE Products Corporation, Westboro, MA.

Jon Ericson holds the post of commander and team chief in the U.S. Army Signal Corps, Dugway, UT.

Currently, **Chris Erikson** attends graduate school at MIT.

James Flanders holds the post of production engineer at Photofabrication Engineering, Inc., Holliston, MA.

Dennis Foley is a manufacturing engineer at Texas Instruments in Attleboro, MA.

Peter Fontana has been named a member of the technical staff at Computervision in Bedford, MA.

Staff Sergeant **Brian Fuller** was recently selected to attend the U.S. Air Force Officer Training School near Lackland AFB, San Antonio, TX. After graduating as a second lieutenant, he will be assigned as a developmental engineer to Hanscom AFB, Bedford, MA.

Michael Gagnon serves as assistant sales engineer at Westinghouse Electric in Jericho, NY.

Jeffrey Giordano is now a career development engineer at Stone & Webster in Boston.

John Griffin has been named project engineer at Gillette in Boston, MA.

Janet Guerrin is currently working for her master's in biomedical engineering at Clemson University, where she is a graduate assistant. She lives in Central, SC.

Patrick Guida serves as a project engineer at Condiesel Mobile Equipment in Waterbury, CT.

Dr. **Robert Gundel,** who received his MBA from WPI last year, is manager of course-ware and media products at Data General Corp., Westboro, MA. He has a PhD, an MS and a BA from the University of Pennsylvania.

Stan Hargus is a senior engineer with DEC in Tewksbury, MA. He received his MS from WPI last year.

Steve Hight serves as a production supervisor at Procter & Gamble Manufacturing Co., Quincy, MA. Steve received the 1983 Charles T. Main Student Section Award for his leadership as chairman of the WPI student section of the ASME.

Yaron Hochman is a product test engineer at Analog Devices, Wilmington, MA.

John Howland holds the post of principal engineer at GenRad in Concord, MA. He also has degrees from Tulane and UConn.

Ronald Joy has been employed as a structural engineer at Andrews & Clark in Amherst, NH.

Mitchell Keamy, Jr., is now a junior civil engineer at General Services Administration in Boston.

John Kociecki serves as a senior engineer at Data General, Westboro, MA. He holds a BSEE from SUNY at Buffalo.

Robert Kodrzycki is doing graduate work in the department of botany at North Carolina State University. He is located in Raleigh.

Victor Kourey teaches in Leicester, MA.

Terese Kwiatkowski continues as a graduate student at Virginia Polytechnic & State University in Blacksburg.

Louis LaForce, who has degrees from St. Anselm College and Rivier College in New Hampshire, teaches at Triton Regional School in Byfield, MA.

William Lamberti has joined Hamilton Standard in Windsor Locks, CT.

Nora Lane works for GE in Evendale, OH.

Allen LeBlanc has been named land surveyor and crew chief for Ewald Engineering Co. in Framingham, MA. He lives in Waltham.

John Letendre has been named an electronic engineer at Raytheon in Bedford, MA.

Karen Lombardo is a civil engineer with the New Jersey Department of Transportation in Newark.

William Lopes serves as a manager of utility and product design for GE in Fitchburg, MA.

John Mansour is with the department of physics at the University of Rochester in New York.

Robert Massaroni is a student at RPI, Troy, NY.

Nancy McLane has been employed as an environmental engineer at GTE Products Corp. in Needham, MA.

Brian McLaughlin is with Sage Laboratories, Inc., Natick, MA.

Scott Menard is an estimator for Robert E. McKee, Inc., Los Angeles, CA.

Ronald Merkel serves as manager of CAM systems at GE in Fitchburg, MA.

Keith Michaud is working for his MBA at Babson College, Babson Park, MA.

Mark Millay works as a mechanical engineer for GTE in Westboro, MA.

Mark Mungeam has been working as an estimator and field assistant for Moore Golf, Inc., of Culpeper, VA, a construction firm that builds golf courses and parks.

Digital has named **Stephen Munyan** a system programmer. He is located in Nashua, NH.

Dean Nahatis works for Andrews and Clarke, Inc., Engineering Consultants.

Jim Nesteruk is a manufacturing trainee for Harris Graphics in Dover, NH.

John Nicholson, Jr., works for Naval Electronic Systems in Arlington, VA, and resides in Falls Church.

Terence O'Coin serves as scientific programmer/analyst at Pratt & Whitney Aircraft in East Hartford, CT.

Lisa Orfan is a programmer/analyst with P.R. Donnelley & Sons in Old Saybrook, CT.

GTE has employed **Mark Padula** as a mechanical engineer at their facility in Westboro, MA.

David Palus works for Raytheon in Sudbury, MA.

Beth Papianou works for the video products division of GE in Portsmouth, VA.

Christopher Pappas is an applications engineer at Data Comm Systems, Inc., Framingham, MA.

Liza Paul, a teaching assistant at MIT, is in the PhD program in physical chemistry.

Aires Pavao works as a senior proposal engineer at Riley Stoker in Worcester. He has an associate engineering degree from Wentworth Institute and a BSME from SMU.

Philip Pearson is an associate programmer/analyst for Data General Corp. in Westboro, MA.

Michael Peszynski has joined Hamilton Standard in Windsor Locks, CT. He has an AS degree from Hartford State Technical College.

Nicholas Pirog serves as promotion and sales coordinator for Analogic in Danvers, MA.

Robert Plante serves as a senior analyst at New England Electric Systems in Westboro, MA.

Michael Quarrey is with the Resource Policy Center at Thayer School of Engineering, Dartmouth College, Hanover, NH.

International Medical Industries of Watertown, MA, has employed **Mark Robichaud** as an industrial engineer.

Ralph Rondinone, Jr., is now a metallurgical engineer at Digital Equipment Corp., Northboro, MA.

Anne Saunders has been named an electrical design engineer by Hamilton Standard in Windsor Locks, CT.

Thomas Shores has been named a mechanical design engineer by Raytheon of Bedford, MA.

Paul Skerker, a fellowship student, is studying for his master's degree at Cornell.

Steven Snyder is a junior member of the technical staff at ITT Avionics Division, Nutley, NJ.

Derek Speed works as a technical support specialist for Digital Equipment Corporation in Marlboro, MA.

Andy Steere is an associate engineer for NBI in Boulder, CO.

Lynn St. Germain and **Maureen Sexton** spent the summer in Europe. Maureen is an MIS consultant for Arthur Andersen & Co., Boston. Currently, Lynn is working for ITT in Shelton, CT. As the secretary of the Class of '83, Lynn requests that her classmates forward their current addresses to the Alumni Office so they won't miss the class mailings.

Neil Sullivan is a master's candidate in computer science at Duke University, Durham, NC.

Ronald Thompson, Jr., serves as a commercial credit analyst at United Bank of Denver in Colorado.

Michael Thorn has been named assistant scientist of quality assurance at Northeast Utilities in Berlin, CT.

Jennifer Toomey is with GE in Cincinnati.

John Vangos works as a quality engineer at Computervision in Bedford, MA.

Vinnie Vignaly is a civil engineer at Guerriere & Halnon, Milford, MA.

Robert Wadja is a manufacturing process engineer for Sprague Electric in Worcester.

David Ward is a senior principal software engineer at Honeywell in Phoenix, AZ.

Mary White works as a planning aide for the Town of Oxford, MA.

Stephen Wright has been employed as a mechanical design engineer at Kollmorgen Corp. in Northampton, MA.

School of Industrial Management

Bernie Olmsted, '58, recently retired as manager of plastics machinery engineering for Reed-Prentice Division of Package Machinery Company following 44 years of service. He now heads B.A. Olmsted & Associates, Inc., East Longmeadow, MA (plastic injection molding consultants). A registered professional engineer, Olmsted has been active with the Society of Plastics Engineers and is a past chairman of the Standards and Safety committees of the Society of the Plastics Industry's Injection Molding Machinery Section. . . . **Theresa Buckley, '77,** has been appointed personnel functional manager for the Maynard (MA) mill complex of Digital Equipment Corporation. The position involves personnel administration responsibility for 4,000 employees in a 12-building complex through a staff of 35 personnel service administrators.

William Poist, '77, executive vice president of Commonwealth Gas Company, recently received the Albert J. Schwieger Award from WPI's School of Industrial Management. He joined the company in 1971 as a division manager in Cambridge. In 1978, he was named executive vice president. . . . **Irving Paton, '78,** works as a principal marketing specialist at Digital Equipment Corp., Merrimack, NH. He has a BS in computer systems from Daniel Webster College, Nashua. . . . **Remi Branconnier, '82,** is currently the chief accountant for Worcester Controls Corp., West Boylston, MA.

Natural Science Program

Larry George, '78, has been named principal of the Guilford Central School in Vermont. Previously he was principal in Henniker, NH, and Amesbury, MA. He received a degree in history from Gordon College in 1967.

COMPLETED CAREERS

Joseph K. Schofield, '09, one of WPI's oldest living alumni, died in Hartford, CT, on September 27, 1983, at the age of 98. He was a native of Rockville, CT.

After graduating with his BSME, he attended National University (now Georgetown) and received his LLB in 1914. During his career, he was an assistant examiner in the U.S. Patent Office, Washington, DC, and assistant patent counsel for Ingersoll Rand, New York City. For more than 40 years he was a patent counsel for Pratt & Whitney in Hartford.

Mr. Schofield, who belonged to ATO, also was a member of the ABA, the Connecticut Bar Association and the American Patent Law Association. A former longtime consultant for the Smithsonian Institution, he was a member of the University Club, the Chemist Club (New York) and the Masons (32nd degree). For more than 50 years he belonged to the Hartford Choral Club and the Unitarian Church, both in Hartford. He was a former president of the Hartford and Washington (DC) chapters of the Alumni Association.

Howard P. King, '12, of Bloomfield, NJ, a retired patent lawyer, passed away recently. He was born in Washington, DC, on February 17, 1890.

After studying civil engineering at WPI, he entered New Jersey Law School, now Rutgers. He had been employed as a patent attorney by the U.S. Patent Office, Mason, Fenwick & Lawrence, DeForest Radio and Arcturus Radio Tube Co. In 1955 he retired from the patent department of Westinghouse in Bloomfield, NJ. For a time he was a self-employed patent lawyer and belonged to several patent law societies.

Helmer P. Johnson, '20, a former executive with Viko Shoe Co. of Worcester, died at his home in West Boylston, MA, on August 11, 1983. He was 86.

Born in Worcester, he graduated as a civil engineer from WPI. He was president and treasurer of Viko Shoe Co. for 44 years, prior to retiring in 1965. He had been a director of the Guaranty Bank and Trust Co., trustee of the Swedish Cemetery Corp. and superintendent of the Sunday School of Salem Covenant Church. He belonged to ATO and Sigma Xi. In World War I he served with the U.S. Army.

Aldo P. Greco, '23, of Lewisburg, PA, retired vice president of Champ Hats, Inc., died in July. He was born in Lavina, Italy, on July 29, 1900.

A graduate mechanical engineer, Mr. Greco had been employed by Simonds Saw & Steel Co., Woodward Wanger Co., Publicker Industries and Ace Mfg. Co., all in Philadelphia. The retired vice president in charge of production of Champ Hats, Sunbury, PA, he held a professional ME degree from WPI and an MBA from Harvard. He was a former president of the Philadelphia chapter of the Alumni Association, as well as an Alumni Council representative.

William B. Gould III, '25, a pioneer in electronics, died at Monmouth Medical Center in Long Branch, NJ, on August 15, 1983. He was 81.

After studying electrical engineering at WPI, he was later employed by WTAG in Worcester, Western Electric Co., RCA, the City of Boston and the (MA) Metropolitan District Commission. From 1940 to 1947 he was a senior radio engineer at the Signal Corps Engineering Labs in Belmar, NJ. Before retiring in 1969, he was a civilian electronic engineer at Fort Monmouth for 29 years.

While at Fort Monmouth, he directed research relating to the application of radio and radar equipment for meteorological problems, as well as the instrumentation of the long-distance guided missile for Cape Canaveral in 1950. In World War II, he was responsible for the installation and operation of early-warning radar equipment on the West Coast. Also, he helped develop radar equipment in all three stages: spark gap transmitter, vacuum tube and solid state.

Mr. Gould had been an amateur radio operator since 1914 and a licensed amateur first class radio operator from 1919 until his death. He belonged to the American Radio Relay League, the National Audubon Society, the Antique Wireless Association and the Garden State Wireless Pioneers. He was a life member of the IEEE and belonged to the Veteran Wireless Operators Association, the Morse Telegraph Club and the Century Wireless Association (charter member).

Arthur W. Haley, '26, of Columbus, OH, died suddenly on August 28, 1983. An electrical engineering graduate, he was born on February 4, 1902, in Princeton, MA.

From graduation until his retirement in 1965, Mr. Haley was with Westinghouse Electric Corp., which he had served as a production supervisor, design engineer and section manager for refrigeration units. He belonged to Sigma Phi Epsilon, the Masons and the American Society of Heating, Refrigerating and Air Conditioning Engineers. He was a former vice president of the Connecticut Valley chapter of the Alumni Association.

Elmer Hansen, '26, the retired head of the electrical engineering section of the Pennsylvania Power & Light Co., Allentown, PA, died on August 18, 1983, at the age of 79. He was a native of Portland, ME.

After receiving his BSEE, he joined GE and was later employed by Iowa Electric Light & Power Co., W. R. Grace & Co., American & Foreign Power Corp. and Florida Power Corp. From 1948 until his retirement in 1969, he was with the Pennsylvania Power & Light Co. generating station in Allentown. Prior to being promoted to section head, he had been senior project engineer in the electrical engineering department. He belonged to the AIEE, the IRE and the Masons.

An avid cyclist, he often gave talks on bicycling. He was active in Congregational Church work for many years.

Walton P. Lewis, '28, a retired Navy commander and former president of the Worcester City Council, died July 23, 1983, in Laconia, NH. He was 77.

Initially a member of the Class of 1928, Mr. Lewis actually graduated with his BSEE in 1954. From 1930 until 1952, he was employed by American Steel & Wire, Worcester, where he served as an electrical cable engineer and consultant for defense projects. For 20 years he was an electronics engineer with the Navy, retiring in 1967. Other employers were RCA and Raytheon. He had retired from Eagles Mere Realty, Gilford, NH.

While in Worcester, he was a city councilman and president of the City Council. He belonged to the Aletheia Grotto, the Masons and various Republican clubs, as well as to the U.S. Naval Institute, the AIEE and ATO. He was a charter member of the Worcester chapter of De Molay.

N. Albert Anderson, '32, died at his home in East Dennis, MA, on July 20, 1983, at the age of 77. A Worcester native, he graduated as an electrical engineer from WPI.

From 1924 until 1928 he was a lab assistant in the WPI physics department. He was then with Norton Co., IBM and Sylvania Electric. He rejoined Norton in 1943. During his career with the company, he served as a machine electrical engineer with the machine division and as chief electrical engineer for the machine tool division, prior to his retirement in 1966.

Mr. Anderson, a former member of Central Congregational Church, Worcester, belonged to the AIEE and the electrical standards committee of the National Machine Tool Builders Association. He was a registered professional engineer in Massachusetts.

Raymond H. Lynch, '32, retired vice president for Ley Construction Co., died at his home in West Springfield, MA, on July 19, 1983. He was 72 and a native of Hopedale, MA.

He graduated as a civil engineer. During his career, his employers were J.G. Roy & Sons, Co., Fiske-Carter Co. and Ley Construction, from which he retired in 1975 as vice president. Until 1981 he was a consultant for Monsanto Co., Springfield.

A registered professional engineer, he belonged to PKT, Tau Beta Pi and Sigma Xi. He was a member of St. Thomas the Apostle Church, the Knights of Columbus and the Springfield Council of Retired Executives.

Emil C. Ostlund, '33, of Pocasset, MA, drowned when he fell overboard while lobstering off Wing's Neck. He was born in Brockton on June 10, 1911.

After graduating with his BSME, he joined U.S. Rubber Co. He then worked for American Steel & Wire Co., a division of U.S. Steel in Worcester. Later, as chief industrial engineer for U.S. Steel, he was transferred to Cleveland, then Pittsburgh. From 1966 until 1968, he served as a U.S. Steel consultant in Spain. He retired in 1969.

Mr. Ostlund belonged to ATO, Tau Beta Pi, the Society for Advancement of Management and the Cleveland Engineering Society. Active in alumni affairs, he had been president of the Cleveland chapter of the Alumni Association, captain for the Alumni Fund, chairman for the capital gifts campaign and a member of the Alumni Council. He was a professional engineer in Ohio and Massachusetts.

Dwight J. Dwinell, '34, a retired manager for GTE Sylvania, died in Newport, VT, on September 30, 1983, at the age of 71. He was a native of Orleans, VT, and a graduate mechanical engineer.

In 1973, he retired as manager of equipment design for GTE Sylvania, Inc., at the company's equipment development plant in Salem, MA. He had been with the company for 37 years. Assigned to the lighting division, he became chief engineer and held several patents.

Mr. Dwinell, a President's Advisory Council member, belonged to the ASTME and the ASME and had been active in Congregational church work. He was a former vice president of the North Shore chapter of the Alumni Association and had worked for the Alumni Fund and for the Committee on Students.

Carl W. Larson, '40, a retired Navy lieutenant commander, died in Memorial Hospital in Worcester on July 19, 1983, at the age of 85.

A Worcester native, he held a BS from Northeastern and an MSME from WPI. From 1923 until 1941 he was an instructor in mechanical engineering at WPI. Also, he had taught at Purdue University and Ann Arbor State College.

He enlisted in the Navy in 1941 and became a lieutenant commander in 1942. During World War II, while serving with the Bureau of Ships, he received a citation from the Secretary of the Navy. He was a member of the Naval Reserves until 1963. Later he became a civil engineer in the assessor's office in Worcester, as well as at the Worcester County Electric Co., where he helped design a central steam generating plant.

Active with the Salem Covenant Church, he also belonged to the Reserve Officers of the United States, the Retired Officers Association, the Military Order of the World Wars and the Retired State, County & Municipal Employees Association of Massachusetts.

Dr. **Robert L. Messier, '40,** editor of *Chemical Abstracts,* Ohio State University, Columbus, died on August 14, 1983. He was born in Worcester on Sept. 13, 1917, and was a graduate chemist.

He joined the magazine, which is a publication of the American Chemical Society, in 1945, after receiving his MS in food technology from the University of Massachusetts and his PhD in biochemistry from Cornell. He belonged to the ACS and the American Documentation Institute.

Francis J. Boyle, '41, a retired mechanical engineer from the Bendix Corp., passed away on September 22, 1983, in Wichita, KS, at the age of 64. He was a native of Saugus, MA.

During his career, Mr. Boyle was with Bryant Chucking Grinder Co., Matthews Mfg. Co., Lapointe Machine Tool Co. and Continental Screw Co. At the time of his retirement, he was a senior project engineer for Bendix in Kansas City, MO. He was a member of the Society of Automotive Engineers, the American Legion and the Elks. A retired USNR commander, in World War II he served in Alaska.

H. William Thatcher, '52, died in Savannah, GA, on August 25, 1983, at the age of 57. He was born in Milford, MA, and received his BSME from WPI.

At the time of his death, he was chief engineer of research and development at Hazlehurst (GA) Mills, a subsidiary of American Oil Corp. Previously, he worked for many years at the former Draper Corp. in Hopedale, MA, and at Molded Plastics Co. in Worcester.

He had belonged to the ASME, Sigma Alpha Epsilon, the Hopedale Country Club (charter member) and the Hazlehurst Country Club (board of directors).

Rodney C. Lewis, '76, formerly of Uxbridge, MA, died in August after being hit by a truck in North Carolina.

He received his BS in physics from WPI and later won a scholarship from MIT's Lincoln Laboratory in Lexington, MA, where he worked as a scientific programmer. Recently he was nominated for a doctorate in physics.

Capt. Brian S. Besser, '79, died in Jedda, West Saudi Arabia, on September 2, 1983, while diving with a fellow Army officer in the Red Sea. He suffered an embolism while he was rescuing his companion whose tank had run out of oxygen.

He was born on May 5, 1957, in Providence, RI. In 1979 he graduated as a civil engineer. While with the ROTC at WPI, he was awarded the Cadet of the Year Award. The Army Meritorious Service Award has been given to his parents for his work in the construction of a military base in Saudi Arabia. Active with the Boy Scouts, he also held the Eagle Scout Award. He belonged to the Baptist Church and Zeta Psi.

Theresa A. Yeager, '81, died in Hartford, CT, on July 24, 1983. She was 24.

A native of Levittown, PA, she was born on Feb. 24, 1959. After studying at WPI, she graduated with a BS in engineering from Columbia University's School of Engineering. She had recently completed the master's program at the University of Pennsylvania in Philadelphia.

At the time of her death, she was with the engineering division of Pratt & Whitney in East Hartford, CT.

In Remembrance and Tribute

Professor Richard V. ("Ollie") Olson, '54, Assistant Professor of Mathematics, died in August 1983. The recently established Richard V. Olson Memorial Award will be a cash prize given each year to a WPI sophomore who demonstrates outstanding performance in the Basic Mathematics Sequence.

The award is designed to recognize and honor Ollie's dedication to the education of WPI students. On the college faculty since 1962, he had developed close rapport with his students and maintained many friendships among alumni.

To endow this award, WPI has instituted the Richard V. Olson Memorial Fund. A faculty committee has been appointed to administer the Fund.

If you'd like to help in maintaining this worthy award, please write:

Sharon C. Davis
Alumni Office
Boynton Hall, 3rd Floor
Worcester Polytechnic Institute
Worcester, MA 01609

FEEDBACK

A Note to the Parents of WPI Students

We are pleased to announce that, beginning with this issue, you will receive the *Journal* with the compliments of the college. We hope it provides you with a closer look at, and a better understanding of, WPI. We'll welcome your comments.

Who's on First?

Editor: In 1954, Alan and I enrolled in WPI's Graduate Physics Program. This program was set up in the evening (a proud first for the Physics Department), enabling us to continue our education while working at the research lab of American Optical Company in Southbridge.

Alan and I completed all the requirements for the degree, and we received our M.S. degrees in Physics in June 1957. I was the first woman graduate of Worcester Polytechnic Institute.

As I recall, the only inconvenience (for me as a woman) was overcome by my carrying a "LADIES" sign to post over the rest rooms on the evenings I attended classes and had to use such facilities.

Audrey Michaels Carlan, '57 MSPH

As Judith Nitsch, '75, reported in her story on women at WPI (August 1983), Leslie Small Zorabedian, '72, was the first woman undergraduate *at WPI.—Ed.*

Counting on You

The August 1983 *Journal* presented a potpourri of "Megameanings," Solomon Golomb's conversion table for scientific units, indicating a series of precise numerical relationships. Here are some additional Megameanings, submitted by a couple of our more, um, creative readers.

10^6 microspheres = 2 hemispheres
10^6 counters = 1 gigacounter
6 gongs = 1 hexagon
100 rabbits (hares) = 1 hectare
1 three-car collision = 1 trident
10^6 bucks = 1 megabuck

—Walter Teal, '78

1/10 Arnaz = 1 Deci Arnaz
10^9 babies = 1 giga gugu gaga

—Mark Lepkowski, '82

TRADITION

Photo The Springfield Kiltie Band

It's the heart of every Reunion Weekend.

Make plans now to renew friendships, rediscover WPI and take home more fond memories of your alma mater.

May 31–June 3, 1984

For the Classes of 1924, 1929, 1934, 1939, 1944, 1949, 1954, 1959 and 1964.

WPI Journal

WORCESTER POLYTECHNIC INSTITUTE

MAY 1984

Catching Clouds Atop Mt. Washington

WPI Journal

WORCESTER POLYTECHNIC INSTITUTE

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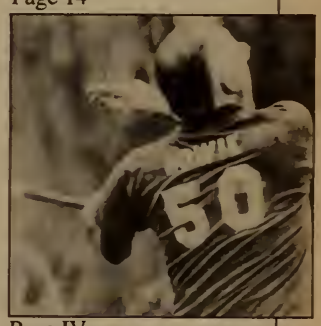

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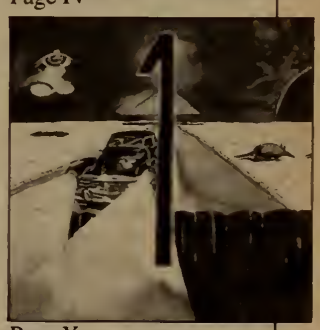

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Cover: Atop New Hamsphire's Mt. Washington, Bruce Daube, '84 ME, tends the cloud collector he and three other students designed and built. Photo by Andrew Cott, '85 EE. Opposite: A Biology and Biotechnology student adjusts a perfusion apparatus that can keep this rat's heart "alive" for hours (Michael Carroll photo).

NEWS FROM THE HILL

Howard G. Freeman

A Change at the Helm

Howard G. Freeman, '40 ME, '47 MSME, chairman and president of Jamesbury Corp., Worcester, was elected chairman of the Board of Trustees of WPI, effective January 1, 1984. He succeeds Paul B. Morgan, '30, president of Morgan Construction Co., Worcester, who served as chairman for five years.

Irving James Donahue, '44 ME, president of Donahue Industries Inc., Shrewsbury, was elected vice chairman of the Board, succeeding Freeman in this post.

Freeman has been a Board member since 1969. He is a director of Rodney Hunt Company, the Stewart Systems Corp. and the Icon Corp. He is also a trustee of the Worcester Art Museum.

In 1972, Freeman received the WPI Goddard Award in recognition of distinguished professional achievement. The award is named after Robert Goddard, '08, the father of rocket-powered flight. Freeman was also awarded the 1976 Engineering Society Achievement Award for inventions, patents, and contributions to valve manufacturing. In 1981 Central New England College awarded him an honorary doctorate in management.

Morgan currently serves as chairman of the Worcester Charter Commission. He will continue as a WPI trustee-at-large. He joined the Board in 1966, succeeding his late father, Philip M. Morgan, to become the fourth generation of his family to serve on the WPI Board.

Construction Update

At press time, construction of WPI's sixth residence center was about to begin, with occupancy planned for September 1985.

The center, as yet unnamed, will be located between Boynton and Dean streets in the block bounded by Institute Road and Salisbury Street. The estimated cost for construction and furnishings is $7 million. The new center, on a site that includes the WPI tennis courts, is in an area where seven fraternities and one sorority are located.

"This new residence center will provide on-campus housing for 229 students," said WPI President Edmund T. Cranch in announcing construction plans. "It will meet the needs of a large portion of those students who prefer to live on campus after the freshman year but—because of limited dormitory space—now must compete for rental housing in Worcester."

For several years, upperclassmen desiring campus housing have had to participate in a lottery. The new center will greatly alleviate, though not eliminate, the present shortage.

The center will be four floors high, of red-brick construction with a sloping roof. The building will be constructed in a series of offset, connecting sections. Housing will be provided for both men and women.

The center will also contain complete dining facilities for residents. (When the building is completed, WPI will operate two separate kitchens and student dining rooms at opposite ends of the campus.) Located in the basement will be a study area and space reserved for computer terminals.

Site preparation involves the removal of five college-owned houses. The WPI tennis courts at the corner of Boynton Street and Institute Road will also be relocated.

This will be WPI's first new building since completion of the Ellsworth and Fuller residence centers in 1973. Since then, construction funds have been directed toward renovation: In 1976, the college's first dormitory, Sanford Riley Hall, was fully renovated, and the following year, Salisbury Laboratories, built in 1887, were completely modernized.

Residence Hall 6 will house more than 225 students. Its architecture reflects the traditional lines of Sanford Riley.

Boynton Hall—one of WPI's two original buildings, constructed in 1868—was then vacated for a year to enable workmen to renovate its interior. Atwater Kent Laboratories were renovated and expanded in 1981 to modernize electrical engineering laboratories and to provide a home for the rapidly expanding Department of Computer Science.

WPI's other original building, the Washburn Shops, is now undergoing renovation. Work began last spring, and a portion of the building was completed in time for occupancy this past February. Work on the original wing will be completed this summer.

"With the end of the current renovation projects, our campus physical plant will be in excellent condition," said Dr. Cranch. "Renovation has enabled WPI to modernize its laboratory and classroom facilities to meet today's educational needs while at the same time preserving the architectural heritage of the college."

Frank DeFalco

Stu MacEachern, New England Division III 150-lb. class wrestling champion.

Winter Sports: The Beat Goes On

Exciting and successful: this was the 1983–84 winter sport season for WPI varsity athletics. All season, outstanding individual accomplishments combined with cohesive and spirited team play, enabling WPI to achieve one of its best seasons in recent memory.

Head coach Phil Grebinar's wrestling team enjoyed its eighth consecutive winning season as the Engineers finished with an 18-3 dual-meet record and placed third at the New England Division III championships. Senior Stu MacEachern, EE, Scituate, MA, and junior Roland Marquis, ME, Nashua, NH, won the 150- and 126-pound weight classes, respectively, at the New Englands and advanced to the NCAA Division III national championships.

Senior Rich Testa, CE, Wayland, MA, had an equally outstanding year, finishing with a dazzling 18-1 record, which set a school mark for most dual-meet victories in a season. Testa also tied the school record for most pins in a year, with 11.

Across the hall in Harrington Auditorium, the men's and women's basketball teams chalked up victories as the men rebounded from a 1-3 start to win 13 of their last 19 games and finish with a 14-9 record.

Coach Ken Kaufman's club enjoyed its third consecutive winning year, a feat that hadn't been accomplished at WPI since the 1938–39, 1939–40 and 1940–41 seasons. This year's campaign saw junior guards Orville Bailey, ME, Springfield, MA (1,180 career points) and Gregg Fiddes, MEB, Webster, MA (1,011 career points) break the coveted 1,000-point plateau. The high scoring backcourt duo currently stand fifth and eighth, respectively, on the all-time WPI scoring list.

Freshman center John Loonie, CS, Brockton, MA, emerged as a towering weapon, averaging 10 points and 9 rebounds a game. In addition he broke the school record for blocked shots in a season, with 49. Next season, WPI will have to replace the performance and leadership of seniors Chris Roche, EE, East Haven, CT, and Larry Manor, EE, Hudson, NH. Roche finished his career by averaging 13 points a game, while Manor was second in rebounding with 153.

Meanwhile, women's basketball earned its first NCAA Tournament invitation and concluded the season at 20-4, the best record in their eight seasons of varsity play. Senior center Chiara Whalen, CE, Brick, NJ, accomplished something no other basketball player at WPI has ever done: becoming the first to tally more than 1,000 points *and* 1,000 rebounds in a career. Chiara finished second in women's scoring with 1,376 points and as the top rebounder with 1,153.

As the season ended, head coach Sue Chapman, who has compiled a 108-52 record in eight years, was named New England Division III Women's Coach of the Year by the New England Women's Basketball Association. She received tremendous performances all season from sophomores Cathy Murray, CM, Berkeley Heights, NJ; Kim Fay, MG, Nashua, NH; Mara Catlin, EE, Shelton, CT; and Donna Leonard, ME, North Easton, MA; and from freshman Cindy Perkins, MA, Nashua, NH.

Finally, the men's swimming team continued its resurgence by winning six dual meets as juniors Bruce Carbone, ME, Leominster, MA, and Dave Jalbert, ME,

West Simsbury, CT, continued to rewrite the school record book. Carbone set new marks in 200 and 400 individual medleys, while Jalbert etched his name in the swimming annals in the 60 freestyle.

—Gene Blaum
Sports Information Director

Gene succeeds Mark Mandel, who last December accepted a position as Sports Information Director at Washington & Lee University, Lexington, VA.

$1.2 Million Grant for Computers

The George I. Alden Trust of Worcester has awarded WPI $1.2 million to help integrate computers into the Institute's academic programs. The grant will be used largely by faculty to computerize their classes, projects and experiments. The remainder will be set aside to begin a fund to plan and build new space for the Computer Science and Electrical Engineering departments, two of WPI's fastest-growing programs.

Commenting on the grant, WPI President Edmund T. Cranch said, "The information revolution, like the Industrial Revolution that began here in New England more than a century ago, will revolutionize education, how we work, and life in general. Colleges must provide students in all disciplines with the expertise to use the power of the computer in a host of contemporary applications."

George I. Alden, who taught mechanical engineering at WPI for nearly three decades, was a founder of the Norton Company in 1885. The Alden Trust also provided funds for constructing Alden Memorial Hall and for renovating Salisbury Labs and Atwater Kent Labs.

New Role for Hebert

To the vast majority of alumni, Stephen J. Hebert, '66 CE, is "Mr. WPI." He has served as Director of Alumni Affairs since 1971 and joined the Office of University Relations in 1969.

Steve's role will be shifting somewhat in the months and years ahead. Effective February 1, 1984, Steve has been appointed Director of Development and Alumni Relations at WPI. According to Donald F. Berth, '57 CHE, Vice President, University Relations, in his new post Steve will be responsible for major-gifts development and planned giving, as well as alumni affairs.

"Steve has achieved an enviable record in alumni affairs," says Berth. "He enjoys the fullest confidence and trust of all of us who've worked with him, both on and off campus. I know of no other individual more ably suited to undertake this vital role."

Under Steve's leadership, the number of alumni actively involved in WPI programs has grown tenfold. The Alumni Annual Fund has received five consecutive U.S. Steel Awards, honoring WPI's campaign as one of the most successful collegiate programs in the nation. Only Dartmouth College and the University of Michigan have achieved similar records of distinction.

Steve Hebert, '66 CE, now oversees major gifts and alumni affairs.

While a student at WPI, Steve was president of Skull, the senior honor society. Following graduation, he returned to Springfield, VT, as teacher and athletic coach in the public-school system.

He joined WPI in 1969 as assistant alumni secretary-treasurer and editor of the WPI *Journal*. Steve serves on the executive committee of the New England region of the Council for the Advancement and Support of Education (CASE) as well as on CASE's national management advisory committee. He is also past chairman of the New England Alumni Trust, a consortium of 100 colleges and universities.

In his free time, which may become even scarcer now, Steve is a local basketball official and has been seen stalking little white balls on the fairways of Worcester Country Club.

Tuition Climbs

In a letter sent to parents in late February, President Edmund T. Cranch announced a 9.6 percent rise in tuition for the 1984–85 academic year, up from $7,300 in 1983–84, to $8,000. The increase will be accompanied by rises in room and board. The actual cost to students, however, will depend on the accommodations and meal plans they choose. For most students living on campus, the cost of a year of tuition, room and board will amount to about $11,100.

Major investments in the use of computers in core courses, projects and laboratory instruction contribute to these increases, Dr. Cranch said. "To ensure the accessability of a WPI education, we are making every effort to minimize relative erosion in our financial-aid program." Last year, WPI provided some $3.1 million of its own funds for financial aid, spread among 1,250 students. "We've made every effort to keep tuition hikes to a minimum," he added.

Redefining the Future Through Computers

By Dr. Louis Robinson

Each morning on New York City's Seventh Avenue, in the heart of the garment district, a man (or woman) dons a white coat and steps to a worktable. He unrolls a bolt of cloth, smooths it on the table, and examines it for imperfections.

Cantilevered over the table is a device resembling an X-ray machine. Finding an imperfection in the fabric, the man moves the cross-hairs aiming system of the device until it shines directly onto the defect. By pressing a control button, he tells the machine's computer system to memorize the blemish's exact geometric location. He repeats this examination until his trained eye has located every defect.

Now, checking the order before him—perhaps for a woman's size 9 dress—he keys that information into the system. All the rules and formulae for this particular dress's pattern, coupled with adjustments for the order at hand, reside in another part of the computer's memory.

Next, the computer lays out the pattern on the fabric, guaranteeing that the pattern never intersects with any of the imperfections already identified. The system also ensures that the least possible cloth is used, while allowing for proper matching of the cloth's design. This done, the worker presses another button, and a laser beam shines from the device, cutting the cloth with glistening speed.

And when the man goes home at night and someone asks him what he does for a living, he replies, "I'm a tailor." And he is a tailor—using technology that is redefining the way he works.

Across town, over coffee, a writer friend of mine queries, "So where is it?"

"Where's what?" I reply. "The revolution," she says. "The *computer* revolution. I still have to vacuum the rugs and drive the kids to dance class and prepare dinner. How has the computer changed *my* life?"

The misconception is common enough. But we're not talking so much about mechanized automation when we refer to the so-called computer revolution. Rather, we're describing technologies that bring about radically improved changes in how we *manage information:* recording, transcribing, organizing, manipulating and retrieving information, data, facts and figures—call it what you want. The computer is simply the symbol of this age of constant change.

To put this amazing technology into perspective, let's visit an earlier player in the drama unfolding: one Johann Gutenberg. Some 500 years ago, Gutenberg's invention of movable type opened the gates to literacy. He gave us our books and our newspapers; and he had a hand in virtually every facet of a rapidly changing world society.

But imagine asking Gutenberg to predict the dramatic consequences of movable type on our lives. What *was* the big impact of movable type, skeptics might ask, besides, maybe, the invention of printing, besides the way we educate ourselves, besides how we think about life, besides how we work and play. . . !

In this way, computers are a lot like movable type, yet to ask for the exact enumeration of the computer's future impact would be as absurd as asking Gutenberg, 500 years ago, to predict the broadest impact of his invention. For today, changes are occurring much, *much* faster.

Foreseeing the trends for the next 10 to 20 years, let alone five centuries hence, is no less impossible for us than it was for Johann. And working in research or education or business doesn't guarantee a clear crystal ball, either. In fact, technologists historically have been very poor forecasters of the long-term implications of their work. In 1926, for example, Dr. Lee DeForest, who invented the vacuum tube, used later (before transistors) in radios and TVs, wrote, "Commercially and financially, I consider [television] an impossibility, a development on which we need waste little time dreaming."

But as the French poet and philosopher Antoine de Saint-Exupéry once observed, "As for the future, your task is not to foresee but to enable." Enabling: this is the mission of the computer.

It's easy to entertain the conceit that computers will never be much more modern than they are today. We may believe that we've seen the ultimate in things like cryogenic circuits, bubble memories, ink jet printers and gas panel displays. But history instructs that these technologies will soon appear dated. Computers will become faster, more reliable; there will be breakthroughs in program-

continued on inside back cover

A Threshold Crossed

Vice President and Dean of the Faculty Ray E. Bolz retires in June. From his Boynton Hall office he's watched over a college that in his 11 years here has recharted its course. He's also looked out on downtown Worcester, a city revitalized by its ability to grab opportunity. Yet this perspective symbolizes the growing need to bring more public and private backing "up the Hill" to a WPI intent on earning greater national recognition. And it's from this office that Ray Bolz's successor, Dr. Richard H. Gallagher, will take up the challenge.

By Kenneth McDonnell

Michael Carroll

It was over the shrimp bowl at a conference of engineering educators that then WPI President Dr. George Hazzard approached his old friend, Ray Bolz, who at the time was dean of engineering at Case Western Reserve University.

"Know of anyone qualified to get a new way of teaching engineering and science up and running?" was Hazzard's query.

"Not offhand," was Bolz's response.

Hazzard came back: "How about you?"

"Me?" Bolz chuckled. "Not a chance."

"Come visit us," the president concluded.

Ray Bolz would soon learn just how persuasive George Hazzard could be.

Ray Bolz was no stranger to innovation in education when he first set foot on the WPI campus in 1973. While at Case Western Reserve University, where he'd progressed through the academic ranks to become dean of the engineering school, he had seen early on that most postwar technological achievements—radar, jet propulsion, nuclear power—came from the work of scientists, not so much from engineering. In response, he forged a new program at Case, Engineering Science. It brought to engineering students fundamental changes in how they were taught, infusing their education with more courses in the engineering sciences and the pure and applied sciences—mathematics, physics, chemistry—and reducing the use of rote formulae in problem-solving.

Later, in the early 1960s, he convinced the Case faculty to eliminate departmental designations in engineering, instead organizing faculty into groups based on subject areas taught. Where previously, say, civil and mechanical engineering professors taught mechanics, now an Applied Mechanics and Structures Group taught it. Likewise, everyone who taught thermal engineering or fluid mechanics was now under the umbrella of the Fluids, Thermal and Aeronautics Group. Students still majored in ME, CE, EE or CHE, but they took courses from these disciplinary groups.

For several years, all went well, until Bolz and his colleagues realized just how unconventional this system was. "It's tough to buck the outside world," he says now. Recruiters, for one thing, had a hard time understanding its merit. And he realized that faculty normally need to be members of professional societies that are associated with departments, rather than by more specialized groups. After a decade of experience, Bolz, far wiser for the experience, gradually reinstated Case's old system.

"George Hazzard convinced me that WPI would be a good place to help run another experiment," he says. When Bolz arrived in Worcester, the nation was in a state of flux. Though campus unrest everywhere had settled down, Vietnam veterans were trying to find their way back

home, and the embarrassment of Watergate was just unfolding.

At WPI, too, there was upheaval, in the form of the WPI Plan—conceived by faculty and students, implemented in a climate of uncertainty and risk. Ray Bolz and Dean of Undergraduate Studies William R. Grogan, '46 EE, MSEE, were given the tenuous task of getting the bugs out of this totally new, untested educational system, one that called for greater faculty commitment and a remarkable amount of freedom for students to design their own curricula, a system whose creation preceded Bolz's arrival by several years. The newcomer became the test pilot.

"I knew of no fallback position," he says today. "It was all or nothing."

Those were tough years at WPI, for both faculty and administration. Courses had to be redesigned for the new seven-week terms. Competency examinations had to be conceived. The massive projects program needed to be up and going. Furthermore, in those transition years some students were enrolled on the Plan; others weren't. All this, while the college went on teaching, housing, feeding, competing in athletics—educating a student body that has grown from 1,800 in 1970 to more than 2,400 today.

The administrative pressures were staggering. Still, Bolz credits the faculty and his colleagues in Boynton Hall for making the Plan work. He admits, though, that "whatever the faculty has become, I'm most responsible," for he has hired about 55 percent of today's roughly 200 full-time teachers.

But Bolz and others knew that the Plan alone could never distinguish WPI in the manner they sought. There was still much to be done, not least of which was motivating faculty to dive into yet other, uncharted waters.

Some departments needed greater strength and breadth. The Department of Management, for example, launched its MBA program in 1980. And in the Biological Sciences, later called Life Sciences and now known as Biology and Biotechnology, students today enjoy opportunities for firsthand work in such fast-growing fields of technology as genetics and cell science. The new Worcester Biotechnology Park, bringing together the resources of business and science to get new ideas in biotechnology to market, will soon take up residence adjacent to the University of Massachusetts Medical Center (near the shores of Lake Quinsigamond). Ray Bolz has helped to make the Park a reality.

Michael Carroll

"The WPI plan was an all-or-nothing proposition. I knew of no fallback position."

In other areas, Bolz orchestrated a reorganization and turnaround that has nurtured a Humanities Department of unusual quality and vigor. He credits past department head Dr. Donald Johnson for much of this success. When Bolz arrived, two separate departments—English, and History, Modern Languages, Music and Art—competed vigorously for attention. "Don and I, with the cooperation of the faculty—particularly Prof. Charles Heventhal—united these two faculties and recruited well over half of the department's 21 full-time faculty," says Bolz.

"The vitality of a college," he asserts, "depends largely on its ability to respond quickly to ever-changing educational demands brought on by conditions beyond the campus gate." The Mathematical Sciences Department, he says, is a good example of how the focus of a discipline should be able to adapt.

Ten years ago, mathematics at WPI was taught largely by "pure" mathematicians. Today, it is an applied mathematics department, preparing students for professions in operations research, computer mathematics, statistics and actuarial mathematics, as well as for graduate school, teaching and scientific research. "And I hope we'll see a Master of Applied Mathematics program come on the scene in the next few years," he adds.

"We're kind of proud of the CAD program, too," Bolz admits. Computer-aided design is finding more and more money-saving applications in all fields of manufacturing. With funding and equipment donated by Computervision Corp., Prof. Ken Scott's ('48 ME) CAD Lab has a waiting list of students eager to get their hands on this exciting technology.

WPI now awards a master's degree in firesafety engineering. Though the MSF Program is just four years old, it is fast gaining momentum as the only master's curriculum in the country. Already, about 35 students are enrolled, and WPI awarded the program's first three degrees during last year's commencement ceremonies.

Developing programs for university/industry cooperation has been one of Bolz's most challenging goals. Largely through his efforts and those of Prof. Donald Zwiep, head of Mechanical Engineering, and Prof. Arthur Gerstenfeld, immediate past head of Management, two vital programs are accomplishing this.

First, MEAC—the Manufacturing Engineering Applications Center—brings sponsoring companies' engineering teams onto campus to work side-by-side with faculty, undergraduates and graduate students. Here, latest-generation industrial-robotics technologies are applied to manufacturing and processing projects initiated by the companies. But MEAC doesn't stop there. Normally, the solutions developed on campus, using either company or WPI robots, find production-scale applications back in the companies' plants.

Says Walter L. Abel, '39 ME, of Emhart Corp., MEAC's founding sponsor,

"We can't say enough about this program. Students get to work with robotics on projects that not only reflect real industrial conditions, but *are* real industrial problems. And MEAC has enabled Emhart's robotics program to move rapidly up the learning curve."

Second, the center for the Management of Advanced Automation Technology (MAAT) unites industry managers and technical personnel with faculty and students to develop better ways of managing today's high-technology organizations.

At one of WPI's older research facilities, Alden Research Laboratories (ARL) in nearby Holden, the quality of the staff has never been stronger, says Bolz. But the character of ARL's work has changed dramatically in recent years, reflecting both access to new technologies available for hydraulics and fluid-mechanics testing and the evolving demand for this kind of research. Today computer modeling augments the more cumbersome, yet still essential and also visually spectacular, large-scale site modeling for which ARL is so widely known.

The ranking academic officer of any college, says Ray Bolz, is there, first, to motivate the faculty and, second, to motivate industry's support of the school's programs. Looking back, Bolz recounts a mixed record in both areas.

That may be so in his mind, but as we've just seen, WPI has been anything but stagnant in the last decade or so. And though everyone, from the president to the deans to the faculty, will tell you there's never enough money, WPI has distinguished itself quite nicely, thank you, considering the company it keeps. Research grants and contracts reached $1.7 million in 1983, up from $509,000 just ten years ago.

Still, Ray Bolz leaves WPI with a few frustrations dogging him: isolated cases where faculty members, who obviously are very talented, have refused time and again to go that extra mile; intense competition with other top colleges for the small

A New Chapter Unfolds

By Dr. Richard H. Gallagher

WPI is the leading institution in the United States in the innovation of undergraduate engineering education. A great deal of evidence has established that the Institute has produced graduates capable of performing superbly in practice and in society at large. These impressive accomplishments have resulted from the dedicated efforts of the faculty and administration who have served since the inception of the WPI Plan. I am honored to be given the opportunity to contribute to these achievements and to the continuance of WPI tradition.

Many challenges lie ahead. The excellence of the WPI Plan must be maintained. No program of engineering education, however sound it might be, can retain its vitality without ever-present attention to the quality of teaching and concern for student advising. Equally important is the infusion of concepts, equipment and practices that are rapidly advancing. To look at the Plan as a static scheme is inconsistent with the philosophy that created it. Changes to bring about improvements where they are needed will have to be devised and implemented.

I've already alluded to a problem shared by all engineering programs, that of infusing the march of progress into the educational process. No other profession so embodies change as does engineering. The model for responding to this change involves the participation of the faculty in research that has an impact, first on graduate study and then on undergraduate education.

The importance of identifying the talents of an institution and of building upon them is well established. However, each strength recognizes special capabilities begun in an isolated form and with limited resources. We must strive toward identifying new faculty and encouraging existing faculty in these new directions.

The recruitment of talented faculty who share these concerns is a key aspect of this issue. In turn, the Institute must represent an attractive environment for those individuals to develop as engineers and as academicians. Because of the way WPI has successfully integrated the humanities, science and other disciplines, faculty other than engineers need to have the same opportunities.

Today, more than ever, engineering education advances in unison with ongoing activities in industry, government and research. For WPI this collaboration is already extensive, due in large measure to the off-campus ties developed through student projects. We need to expand these relationships even further, to serve the professions on the one side and also to encourage support of projects, graduate research, and the acquisition of new equipment.

The response of the Institute to the expanding role of computers in higher education is another major issue. The steps we take to develop this role must be academically sound, consistent with the functioning of the engineering professional in a career that will span many years, and able to strike a balance between the rapid obsolescence of equipment and the cost of that equipment. As administrators, we are challenged to put the equipment and facilities in place. The faculty must then update courses to incorporate effectively these computational advances.

Dr. Gallagher, dean of the College of Engineering at the University of Arizona, Tucson, will succeed Ray Bolz as Vice President and Dean of the Faculty effective July 1, 1984. Professor of civil and environmental engineering at Cornell University for 11 years, he also has worked at Bell Aerosystems in Buffalo, NY, and was with Texaco.

group of young faculty candidates he'd like to hire; attracting dollars into fledgling programs; wrestling with the best way to integrate computers into higher education.

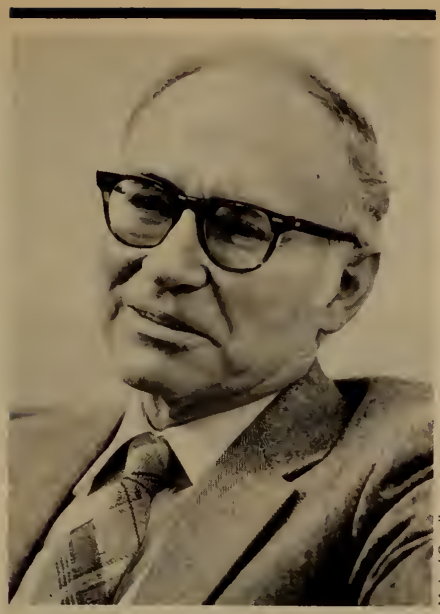
Finally, he longs for a return to the kind of faculty thinking that created the WPI Plan. "Back in the late '60s, faculty thought hard about teaching and learning." Today, he says, WPI and its kindred institutions need more of this innovative thinking. "We've got to reconsider how we can use things like computers and television to make the learning process more effective, efficient and, most importantly, more motivating for students."

Yet one challenge, he believes, will dominate all others in the coming decade. "WPI's graduate programs simply must be developed more vigorously." He admits, though, that the scenario he envisions is a chicken-and-egg situation.

"Typically," he says, "graduate students in, say, chemistry or EE are attracted to a college or university by a particular professor whose work has won national recognition. But to attract and keep this caliber of faculty, you must make the college an exciting place for them to be. And you've got to be able to meet their expectations for laboratory facilities, salary, release time for research." This means you need money—lots of it—to support the level of talent that will attract students. "We've made considerable progress," he adds, "but much more needs to be done."

A major component of this equation—faculty salaries—is steadily becoming competitive on a national scale, Bolz says. "We've tried to reward faculty for their efforts." Low faculty attrition reflects this trend.

Naturally, as cost of operations rise, tuition increases follow. And in an era of a shrinking college-age population, maintaining—indeed, enhancing—the quality of all programs, from academics to housing to athletics, becomes all the more critical to remaining competitive. "Parents," he says, "must be confident that a WPI education is well worth the cost."



Michael Carroll

"At most colleges, faculty members often try to build their own little empires, treating undergraduates as a necessary inconvenience. WPI is different."

And what about the WPI Plan, the bold experiment Ray Bolz was brought in to help conduct? Few would argue with the concepts validity, he asserts. "Student projects, curriculum flexibility, intensive work in the humanities: these are the elements of WPI that set it apart from nearly every other college."

Yet the view from Boynton Hall has enabled him to form a clear picture of where change in the Plan is likely to occur. "In some ways, as we learned at Case, you can't buck the outside world." Grading, for one thing—currently recognizing only distinguished, acceptable or no credit performance—may well return to the traditional A-B-C-no-credit format, he predicts. Prospective employers and graduate schools, he says, sometimes can't easily make the translation.

Another element of the Plan, the competency examination, has been a topic of heated discussion on campus almost from the Plan's inception in 1972. The "comp," which tests seniors in an intensive two-day written session, places tremendous pressure both on students, who must pass it to graduate, and the faculty, who must devise and administer the exam. "There's got to be a better way to test competency," he says. He points to an idea proposed by Dean of Undergraduate Studies William Grogan as having special merit. Under this scheme, rather than being tested by as trauma-filled comprehensive exam, students would defend the projects they've completed in oral presentations before faculty and industrial project sponsors, much as doctoral candidates defend their dissertations. "This could be a much more meaningful and efficient use of everyone's efforts," he contends.

Ray Bolz grew up in the Depression. The son of a machine operator from the Shaker Heights section of Cleveland, he put himself through Case Institute of Technology, beginning a long association with that institution. He graduated from Yale in 1942 with an MSME and joined the National Advisory Committee on Aeronautics (NACA, later NASA), working to perfect jet engines. He later headed NACA's combustion research section in Cleveland. Following WW II, he went back to Yale to pursue his Ph.D., finishing it in 1949 while teaching aeronautics at RPI. In 1950 he returned to Case, there to climb the academic ladder until George Hazzard convinced him of the opportunities at WPI.

Now, 11 years later, Ray Bolz is looking forward to the freedom that retirement will afford him—more times to pursue other interests he's developed over the years. "I'll be a little less busy," he admits, but with the new house he and his wife Jean are building off Salisbury Street in Worcester, a summer cottage on a pristine lake in Michigan, four daughters, nine grandchildren, woodworking learned at the Worcester Craft Center (of which he's president)—well, he's hardly slowing down. And he may well find himself heading special assignments for the college, according to President Edmund T. Cranch.

"I suppose I'll have to take up fishing now," he confides. One of his grandsons is at the age where soon he'll no longer be content to stand at the end of the dock and watch the small fish take his bait. "He'll want to be out in a boat before long, looking for bigger catches." Kids are like that.

HIGH ADVENTURE IN A BIG STAKES GAME

You'd think that the high-pressure world of foreign-currency exchange would demand a B-school grad at the reins. But look closer at the head trader for Merrill Lynch.

Story and Photos
By Kenneth McDonnell

Most people would consider the setting glamorous, maybe even exotic. You enter on New York City's lower Broadway, smack in the middle of the Wall Street financial district, literally in the shadow of the looming twin towers of the World Trade Center, just a block or so from the bustling New York Stock Exchange. Though no cash ever comes on the premises, you need a special combination to free the door lock and enter the suite of offices. Strolling the long, richly carpeted and detailed 15-foot-high corridor, you still have no idea of what is in store.

Suddenly, turning left at a receptionist's desk, you are there. Through a thick glass door you enter a setting whose mood seems far too laid-back for the gravity of the activity going on. A battery of 20 custom-built computer consoles, arranged in a huge block "C," an overhead news display and dozens of telephones make you think they might be launching spaceships or some such from here.

James Hohorst, '76 CE, in the foreign currency trading room at Merrill Lynch.

One wall of glass looks out over Broadway, a floor below. Everything—the lighting, the upholstered furniture, the potted plants—is subdued. The people here are all well-scrubbed and well-clothed, and thus carry the best of diplomas. They are intensely busy at their communications terminals, yet they don't appear overly stressed. No hair-pulling. No chain-smoking. No nail-biting.

But don't be fooled.

The game that's played here is one of the riskiest in town. Here, in the foreign-currency trading room of Merrill, Lynch, Pierce Fenner & Smith Inc., deals worth hundreds of millions of dollars pass into and then out of the hands of people who are mostly in their late 20s and early 30s. Careers can be made or wasted on split-second, multimillion-dollar decisions. The place buzzes. Burnout can come by age 40.

In the midst of all this stands a tall, slender 29-year-old. Usually he is inside the "C," leaning over consoles, consulting with his traders, taking calls from the commercial banks, corporations and wealthy individuals who are Merrill Lynch's international-currency customers. His calm, collected, easygoing demeanor, just the opposite of what you'd expect in this pressure-cooker environment, sets the tone. James Hohorst, '76, is clearly in charge.

Jim Hohorst came to Merrill Lynch (ML) in 1981, after the financial-managment giant lured him away from Citibank to build up its young foreign-currency department. He'd spent a few years in Greece and London with Citibank before taking over at ML.

Hohorst studied civil engineering at WPI, but he never practiced it. His demonstrated abilities in logical yet creative thinking convinced steady old ML to reconceive the entire set-up of its trading room. "I'm probably best at planning," he says, "and lousy at anything routine."

Where desks were formerly lined up matrix style, piled high with video screens, he argued for a plan with consoles low enough so that every trader could make eye contact with nearly every other trader in the room. Where before traders had yelled out their transactions to a clerk, he fought for direct input by all traders into their own on-line computers.

And when resistance to such a set-up was heard from old-style traders, he convinced them to try it. They've loved it. Says one, "This whole arrangement—the computers, programs, worldwide instantaneous communications, even the chairs—was Jim's doing. This place is like no other in the business."

"I've tried to set up this operation to work with or without me in town," says Hohorst, "so it can remain profitable even in my absence. The flow of currency orders is the key." For ML, the billion-dollar

This is no trading pit. "It's more like controlled frenzy," says Hohorst.

payoff has been nothing to cough at, but it's still in its infancy.

Trading in foreign currency, Hohorst explains, is complex but essentially little different from buying and selling other things. The stakes, though, can be enormous: $5-million transactions are expressed here as $5. "I try to get my traders," he says, "not to be intimidated by the sums of money they handle."

ML deals in only four currencies: the British pound sterling, Japanese yen, Swiss franc and West German mark. Customers' objectives are as diverse as their nationalities. A German auto-maker, for instance, may need to convert funds it earns in U.S. dollars to marks in order to pay employees and suppliers for cars built in Germany. Another company, this one American-based, may want to buy a Japanese company. Or, a German individual may be selling machine parts to a French customer. In each case, currencies must be converted, and to do so, parties come to investment firms or commercial banks.

"The market is so volatile," says Hohorst, "that we use four digits to the right of the decimal point for the amounts we deal with." Positions are held for as little as a couple of hours. "A long-term position is usually a week," he adds.

Hohorst's operation is part of Merrill Lynch International Bank. His and similar arrangements at other major investment firms are rapidly luring customers away from commercial banks, who traditionally have set the pace in services offered in the foreign-currency exchange market. Says one trader, "Commercial banks' decision-making is more laborious. Here, we accept risk as a way of life."

ML and others are raising the curtain on all sorts of new services, such as borrowing in the U.S. commercial paper market, then swapping the dollars in a short-term currency transaction, instead of borrowing in a foreign currency; or writing contracts for clients who don't have credit lines at a bank and want to do foreign exchange on a margin basis. "If a customer can give us a $5-million deposit," says Hohorst, "we'll give him a $50-million foreign-exchange line." No wonder the banks are frustrated by the investment firms, themselves steady customers of the commercials.

The mood is intense yet relaxed under Hohorst's lead. He designed the entire office, specified the computer hardware and even wrote the programs.

Another suprise about Hohorst's trading room: You'd think it would be populated by business-school types, with the kind of derring-do that characterizes so many MBAs.

Derring-do? Yes. MBAs? A few. In fact, says Hohorst, "one of the people I've hired has an advanced degree in medieval French literature." And in February, he hired Brian Wasko, of Mountainside, NJ, a graduate student in chemical engineering at WPI. Says Wasko, "I've always been fascinated with finance, and this seems like an ideal place to get my feet wet." He's now training alongside a more experienced trader.

"This is a business of wheeling and dealing and outguessing the market," says Hohorst. "Whether it's knowledge, intuition or luck that makes us successful, I don't care. I hire people on those bases, too. Like trading, I win some and I lose some. It's our position in the longer term that I watch." He adds, "You have to love this business. But it can consume you even if you do."

Jim Hohorst strikes you as the kind of person who'll be great at whatever he does. At the top of his profession already, you wonder what he'll do next.

"Real-estate development has always interested me. I think I'd enjoy that." Time spent in London and Europe showed him how totally unexploited at least one part of many cities is—the waterfront. European cities, he observes, have done wonders with their old wharves and waterfront areas, converting them into townhouses, shops, parks. "Most U.S. waterfronts are rotting," he complains. "If I had the capital, I'd think about renovating right here in New York or Hoboken."

Jim Hohorst thrives on getting involved in lots of aspects of his business—not just running things, but designing necessary technology and furniture, writing computer programs, hiring and developing staff. "I really think WPI had a lot to do with this," he says. "WPI taught us how to solve problems, not how to memorize formulae or take tests. There's a world of difference."

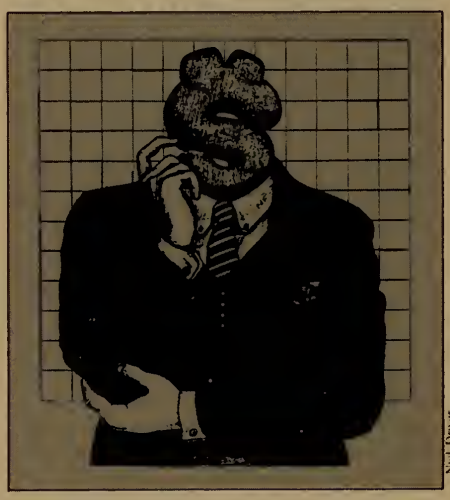
INVESTING IN THE FUTURE

At almost $57 million, WPI's endowment is at an all-time high. Two of our money men tell their secrets of success.

According to a 1982–83 survey of 60 private-college endowment funds between $25 and $100 million, WPI's performance ranked in the fourth quartile. Our ten-year average total return was 10 percent compared with the Dow Jones 30 Industrials (DJI) average of 8.7 percent. And on a five-year basis, WPI ranked in the upper third with a 15.5 percent average total return, compared with the Dow's 14.8 percent.

How has the college gone about achieving this level of performance, we wondered. Annual reports don't always get to the heart of the matter. So, for answers, we visited with two of the people most familiar with WPI's investments, David Lloyd, Vice President for Business Affairs and Treasurer; and John Hossack, '46, chairman of the Trustees Finance and Investment Committee (TFIC) and Vice President, American Appraisal Corp., New York City.

We'd like to share their perspectives with you.



Nick Driver

What are the roles of the TFIC and the chief financial officer of the college?

Mr. Hossack: Basically, the TFIC establishes investment policy and oversees the implementation of that policy by the financial management firms the college retains. The committee sets guidelines for the financial performance it hopes to achieve, then periodically reports these results to the Board and the college.

Since 1976, 60 percent of the endowment has been managed by a "money manager." This firm has generated an average total return of 44.6 percent in that period, compared with the DJI average of 15.2 percent. And over five years, these performances have been 53.4 and 49.2 percent, respectively.

The balance of the endowment (40 percent) is managed by a bond manager and internally by the college. This portion is invested in short-term securities. The investment goal for this piece of the endowment is to obtain a maximum, prudent flow of investment income.

Mr. Lloyd: The TFIC is cognizant of the cash flow requirements of the college operating budget and works to maintain the purchasing power of the endowment, that is, protecting it from the erosion of inflation.

What are the trends in WPI's endowment growth?

Mr. Lloyd: In the past eight years, the college has averaged a 16-percent total return on its investment. This compares with a Dow Jones average of 11 percent and a Standard & Poor's 500 average of 13.3 percent. Fiscal year 1981–82 was an especially good period, as we found ourselves in the upper 10 percent of the National Association of College and University Business Officers (NACUBO) survey of 200 private college endowments. In 1982–83, however, our performance dropped to about the middle in the survey, due largely to the volatility of the financial markets. During this period, the college felt it most prudent to invest in high-yield investments and to take advantage of capital gains in solid, well-managed companies.

Mr. Hossack: At the present time, as the market climbs slowly, we're looking to lock into secure yet longer-term investments. And though inflation is down considerably from its level of the past several years, we're still working hard to preserve the endowment's purchasing power.

Mr. Lloyd: A vital element of how we manage WPI's assets is the school's enrollment targets. For at least the next few years, WPI intends to maintain enrollment at 2,400 to 2,500 undergraduate students. To continue providing the present educational quality, we need to keep adding new, more advanced laboratory equipment, computers and dormitories. But beyond normal tuition increases that keep pace with inflation in operating expenses, a stable enrollment means that tuition can't contribute very much toward purchasing those necessary capital improvements. Therefore, we have to be even more effective in controlling operating costs. We also have to seek more gifts to the college—like cash, hardware and research grants. More students would bring in more income, certainly, but we feel such a shift would cause unwanted crowding, as well as compromise the quality of WPI's educational programs.

How has the college been able to achieve such outstanding financial performance?

Mr. Hossack: We've simply been fortunate in selecting excellent money managers. A key part of these relationships is the flexibility we give these firms in managing the college assets. But there's nothing unique about their philosophy. They have a great deal of discretion in working to meet the investment objectives set down for them. Fortunately, they are highly attuned to the workings of the stock and bond markets. Currently, our investments

Robert Salter

John E. Hossack, '46 ME, chairman of the Trustee Investment Committee.

are divided about evenly between these two kinds of investments.

What are WPI's basic financial objectives?

Mr. Lloyd: Although most colleges would consider it high, one element of WPI's endowment investment strategy is to produce a 6-percent pay-out to operations, based on a two-year average of the endowment's market value. Our goal is for the total return to meet or exceed this 6-percent pay-out plus the consumer price index (CPI) rate of change. We insist that our money managers perform at this level.

Mr. Hossack: We try to keep our objectives simple, avoiding trendy moves. We just try to place WPI's assets in markets that are liquid and offer a fair chance to realize the returns we need.

How were these money management firms selected?

Mr. Hossack: Probably in much the same way that individuals select banks, mutual funds, money-market funds or other financial management companies: reputation and word-of-mouth. Of the dozens we know about, we sat down as a committee and weeded out the three or four we wanted to interview. When we met with these firms, we examined their track records and assessed how well they conduct their own research. We also got an idea of how individuals in the firm impressed us. After all, it's people in whom we place our trust for managing the assets of the college. We then monitor the performance of the firms. If our expectations are met over time, we normally see no reason to jump ship. Currently, we retain two money management groups: one locally and the other a national concern. In addition, as we've said, a small portion of the investment decisions are made internally.

Does the college invest in real estate, or in options or other higher-risk instruments?

Mr. Lloyd: Naturally, the campus is by far our largest real-estate investment, with its current value estimated at more than $100 million. The college also holds the mortgages on several fraternity houses. But beyond that, WPI is not in the market for public real estate. It's usually not liquid enough for the flexibility our investment strategy demands. The one exception is when we need properties adjacent to the campus for expansion. This occurred south of Institute Road, when we built the Ellsworth and Fuller residence complexes, and in the Boynton St.-Dean St. neighborhood, where Residence Hall 6 will be built.

Mr. Hossack: As far as the options market is concerned, we tried this route in the early 1970s, but got nowhere with it. Currently, we avoid options. They're too volatile. You might consider things like stock options and commodities for your own investments, but not for WPI's.

What are the key challenges in managing cash flow and operating budgets?

Mr. Lloyd: Once again, maintaining the flexibility we need to enable us to seize opportunities in the stock and bond markets is vital. We don't like to get locked into one investment formula that can't accommodate this need. In addition, of course, we need cash to run the day-to-day operations of the college. That goes without saying for all colleges. Flexibility enables us to know right where our net worth—translated into cash terms—is at all times.

Mr. Hossack: We attempt to maintain what we believe to be ideal cash balances to meet operating costs without going to outside financing sources or invading the endowment's principle. An exception is outside financing from direct revenue-generated sources such as dormitories.

Where does WPI's income come from?

Mr. Lloyd: It comes from a number of sources: Tuition and fees, 72 percent; endowment pay-out, 7 percent; annual giving, 3.1 percent; sponsored research and other educational operations, 15.2 percent; auxiliary operations, 1.7 percent; and miscellaneous sources, 1 percent.

How does the college fund construction of revenue-generating facilities, such as residence halls, compared with academic and athletic facilities?

Mr. Lloyd: Typically, we sell term bonds to finance new dormitory construction. Residence Hall 6, for example, to be completed in September 1985, will be financed mostly through a 15-year tax-exempt bond issue through the Massachusetts Health & Education Facilities Authority (HEFA). The income from that facility—room and board—will largely pay off the debt. Overall, WPI's credit rating is excellent. Academic and athletic facilities, on the other hand, are usually financed through capital campaigns, as was the case with the renovation of Atwater Kent and Washburn Shops, as well as from other gifts and grants.

Marvin Richmond

David E. Lloyd, Vice President for Business Affairs and Treasurer.

How is student financial aid funded?

Mr. Lloyd: From an accounting standpoint, we treat financial aid as a separate revenue/expenditure cost center. Student aid is derived from a host of sources: federal and state grants, corporate, individual and private grants, income from endowed student aid, and allocations from the operating budget. Loan funds are available through the National Direct Student Loan Fund, WPI loan funds and federal loans. For the first time this year, loans are available through the Massachusetts College Student Loan Authority.

In 1982–83, 57 percent of WPI students received financial aid, totaling nearly $4.4 million, in the form of scholarships, loans or work-study employment. In the current academic year, the amount will be about $6.9 million.

In addition to these conventional forms of aid, deferred tuition payments are becoming widely popular. These are similar to fuel-oil budget plans, where the family of a student, for example, pays a fixed amount every month of the year to a financial institution, which holds the accumulating balance in an interest-bearing account until the student's college tuition is due. It's amazing just how creative the private sector can become when government programs are level-funded or monies are re-allocated to other priorities, as appears to be happening.

To Capture a Cloud

Four WPI students spent seven weeks with their heads in the clouds. They came away with a new device for measuring the acid content of clouds—and a grant for $10,000.

By Michael Shanley

The Appalachian Mountain Club (AMC) had a problem, a problem as big as Mt. Washington itself.

The oldest mountain club in America wanted to find out if not just acid rain, but acid *clouds* were contaminating the fragile alpine environment of New Hampshire's White Mountains. To gather information, AMC Research Director Dr. Kenneth Kimball had been testing cloud-water collectors near the top of 6,288-ft. Mt. Washington, the highest point in New England.

Since the upper reaches of the mountain are in the clouds some 300 days a year, the alpine vegetation gets a significant amount of its water from clouds that brush up against the mountain. It seemed the perfect spot to examine the possibility of "acid cloud" contamination.

But there were a few problems:

- Like the fact that winds frequently whip across the mountain at 60 or 70 mph, with gusts up to 150 mph or more. (It was atop Mt. Washington, in fact, that the world's highest recorded wind speed—231 mph—was measured in April 1934.) Any cloud collector would have to be, first and foremost, of unshakable design.
- Like the fact that, atop Mt. Washington, these winds change direction capriciously. Any instrument, therefore, would have to be "omni-directional"—capable of collecting cloud water from any angle.
- Like the fact that the site chosen as best by the AMC was four miles—and 4,000 feet up—from the nearest road, putting a limit on the overall size and weight of the collector.
- Like the fact that, because of its distance from civilization, the collector would have to operate without continual supervision.
- Perhaps most important, the collector had to be able to keep rain from contaminating the cloud samples.
- Add to this the simple fact that the AMC does not have the funds of a General Motors; in other words, the project's budget would not support high-tech hardware.

It would, however, support a creative, down-to-earth approach to the problem. Here's how the story unfolded.

In the summer of 1981, the AMC, in cooperation with acid-rain research pioneers Dr. Gene E. Likens of Cornell University and Dr. F. Herbert Bormann, director of ecosystem research at Yale

Bruce Daube

On-site (above), between cloud "events," the collector will measure acidity in alpine regions besides Mt. Washington. With their heads in the clouds (opposite, from left): Andrew Cott, Reynold Dobson, Bruce Daube and Peter Lamar.

University, began its research on the acid content of cloud water. Their base of operations was the AMC's mountain activity headquarters at Pinkham Notch Camp, near the foot of Mt. Washington.

Cloud-water collectors were set up at two White Mountain locations: at Greenleaf Hut on Mt. Lafayette and at Lakes of the Clouds Hut, located in a col, or pass, between Mt. Washington and Mt. Monroe.

There were problems almost immediately. The collectors the AMC was using simply weren't working properly.

The procedure had been to take samples once a week. But if the weather for the previous week had been consistently cloudy and windy, the 500-ml collection bottles overflowed. On the other hand, if the weather had been dry and windy, the strands collected dry deposition—bugs, dust and other debris—which would modify the samples' chemistry. Finally, since samples were collected just once a week, only the average chemistry of an entire week's worth of weather conditions could be determined.

These problems plagued the project all that summer and the next.

In 1983, Dr. Kenneth Kimball, a 36-year-old biologist, joined the AMC as research director at Pinkham Notch. "It was obvious there were some real problems with the collection system," he says. "Some changes had to be made."

Kimball decided to alter the sampling technique. With support from the Weyerhauser Foundation, a new AMC program was set up using "event"—rather than weekly—samples. The collectors would be readied before each impending "cloud storm," and emptied immediately after. Because the collectors would now require increased attention, the Mt. Lafayette site was abandoned and both collectors were set up at Lakes of the Clouds.

But again, major problems surfaced. Because of high wind speeds, rain falling on Mt. Washington can travel almost horizontally—so when the weather was cloudy *and* rainy, the cloud-water samples were contaminated by rainwater.

To alleviate the problem, a small roof was built over each collector. But rain still blew under the roof and into the collector. What's more, the roofs themselves ultimately snapped off like matchsticks. One was later found on an altogether different mountain.

The next idea was simply to disconnect the collector when it was raining, then reconnect it later. But this meant the collector required almost constant attention. Also, even when the collector was disconnected, residual rainwater gathered on the strands, thus raising the threat of contamination. Finally, it meant that no cloud-water samples could be taken during a rainstorm. But this, too, was unacceptable, since one of the things the AMC wanted to determine was whether the acid content of cloud water changed during a rain-storm.

"Again, we had problems," says Kimball. But rather than being discouraged by the setbacks, he was spurred on. "It was a challenge, and that's what science is all about."

About this time, two mechanical engineering majors at WPI, senior Bruce Daube, from Weatogue, CT, and junior Peter Lamar, from Exeter, NH, approached chemical-engineering professor Robert Wagner, an avid mountaineer and past vice president of the AMC The students, outdoorsmen themselves, wondered if Wagner, who in the past had overseen a number of Interactive Qualifying Projects (IQPs) with the AMC, could arrange a project that would accommodate both their intellectual curiosity and their love of the outdoors.

Wagner said he'd see what he could do.

"I hadn't met Ken Kimball," recalls Wagner, who has climbed 63 peaks in New England, often in winter, as well as mountains in the Austrian Alps and the Rockies. "But in the past we had had some good projects with Ken's predecessor."

By now Daube and Lamar had hooked up with Reynold Dodson, from Gales Ferry, CT, and Andrew Cott, from Nashua, NH, two junior electrical-engineering majors searching for a similar project. Phone calls went back and forth, until, finally, an assignment became clear—the students would try to design a new collector that would require considerably less attention and eliminate the problem of rain contamination.

It was decided that the project team would spend an entire seven-week term at the AMC headquarters at Pinkham Notch. (In addition to covering most equipment costs, the AMC would provide the students with room and board.) A good deal of those seven weeks would be spent at Lakes of the Clouds Hut.

The "hut" at Lakes of the Clouds is really a bunkhouse, which during the summer months offers accommodations for up to 90 hikers who prefer to temper their treks with some of the amenities of civilization.

If the sky is clear, you can step out of the hut onto the rockhewn landscape and gaze out across upward of a hundred miles of New Hampshire countryside. From up there, the land looks strangely uninhabited—even untouched—and you can forget for a minute about things like crumbling factories and belching smokestacks.

But in the Midwest, in places like Ohio and Michigan, these things are not so easy to forget. And, according to most experts, that's where the acid rain that reaches the Northeast comes from. The Midwest, these experts say, is exporting its pollution to places like the White Mountains. Sulphur-dioxide emissions from factories, refineries and power plants are produced in the Midwest, travel hundreds of miles with the wind, and fall as acid snow and rain on the lakes, streams, farms and forests of the northeastern United States and Canada.

How bad is the problem? "Normal" rain, which is slightly acidic, registers 5.6 on the pH scale. (A perfectly neutral substance rates a 7.0.) The acidity of New

England's rainfall, says the Environmental Protection Agency, is about pH 4.5. Since a change of 1 on the pH scale is a tenfold change, that means the rain in New England is at least ten times more acidic than it should be.

But what about the clouds, the clouds that are so much a part of the high-altitude environment? How acidic are they? wonder people like Gene Likens, Ken Kimball and Bob Wagner.

When the four students arrived at Lakes of the Clouds Hut in the beginning of last September with their newly built cloud collector, the last of the summer hikers were enjoying the waning days of warm weather.

The collector the students had hauled up to the hut was radically different from any that went before it. While other models were upright cylinders, the WPI collector was a 3-foot-long rectangular box made of 3/8-inch-thick plexiglass. It weighed about 40 pounds, not including the sturdy wooden base on which it was to stand. The entire contraption weighed nearly 100 pounds.

"It was quite an experience getting it up the mountain," grins Lamar. "It was about four miles and straight up all the way."

The crucial difference between the WPI collector and its predecessors was in the deceptively simple-looking arrangement of baffles at the front of the plexiglass box (see sidebar).

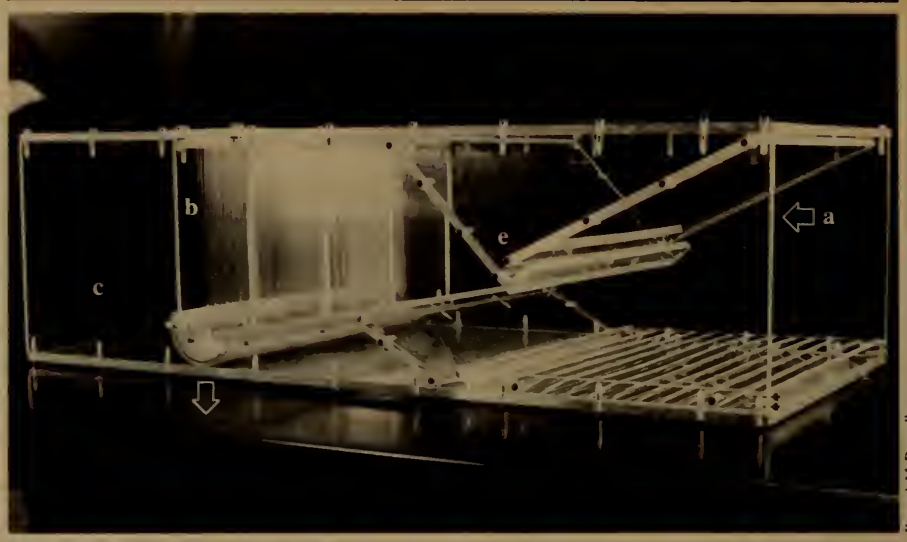
"All along, we knew that our collector had to separate the large raindrops from the tiny cloud droplets," Daube adds. "That was the most important thing."

Easier said than done, especially when 100-mph winds are thrust into the equation. But the students had spent a good part of the summer researching the project and mulling over design possibilities. When the four reached the hut with their collector that September day, the toughest work was already behind them.

The project actually began the previous May when Kimball invited the team up to Pinkham Notch for a preliminary meeting. A rough time-frame was set up. In August, after a summer of background work, the four spent a weekend at the hut and observed the two AMC collectors.

"They were good at collecting cloud-water samples," says Cott, "but weren't designed to keep out the rain."

Ultimately, a design idea was presented, trial-and-error revisions were undertaken, and the final details were worked out. In late August, just before school was to begin, the project team met at WPI. "The collector itself we built in a week," says Daube.



Kenneth McDonnell

Basically, a collector works like this: a cloud (a) is forced, either by the wind (in the case of a passive model) or by a fan (in the case of an active model) to pass through a number of Teflon strands (b) housed within the collector's plexiglass shell (c). In turn, the tiny cloud droplets that are forced through the collector attach themselves to the strands. When the droplets grow large enough, they run down the strands, through a funnel (d) and into a plastic collection bottle.

The WPI model is distinguished by its plexiglass construction and its rectangular shape. The lipped baffles (e) that separate rain particles from cloud particles are a major innovation, the product of many hours of computer modeling and actual testing.

To determine the position and arrangement of the baffles, a dizzying array of laws, formulae and environmental conditions had to be considered. Terms like particle trajectory, terminal velocity and sling-out characteristics were bandied about.

Final design permits only the tiny cloud droplets to snake their way through the collection surface itself—a series of vertically aligned Teflon strands. Larger raindrops are filtered out by the lipped baffles.

The Teflon strands themselves were a major consideration. Again, there were a host of variables: strand diameter, flow restriction, wind velocity, droplet density, air viscosity. Hours were spent writing computer programs to calculate the efficiency of different strand arrangements. The final setup involves three collection cartridges, each with eight rows of Teflon strands placed 1/8-inch apart.

In another major innovation, the WPI collector features removable collection cartridges—a dirty one can simply be replaced with a spare, then cleaned. In order not to upset the chemistry of the samples, virtual surgical cleanliness was essential.

"We had to throw out 48 samples after we found they were contaminated, even after we had cleaned them with a hydrochloric-acid solution and rinsed them with distilled water," says Dodson. "It turns out we hadn't used enough rinse."

Now that the baffle and cartridge arrangements were completed, the final design elements could be decided upon: overall distance between baffles and cartridge, location of collection troughs and bottles, use of stainless-steel bolts and steel-threaded inserts rather than glue, a rotating stand with two pillow block bearing assemblies and a stainless-steel shaft, and a wooden 2-by-4 base connected to the shaft by an aluminum plate. To protect the fragile alpine tundra, rocks would be used to secure the base rather than an anchor that would involve digging or drilling.

The final need was a wind tracker. After some experimentation, a 3-foot wind vane with an area of 160 square inches was attached to the rear of the box.

Like many mountain sites, the natural wonder of Mt. Washington has a terrible beauty. Winter comes early there, and as October approached members of the project team saw Lakes of the Clouds transformed from a tranquil oasis of comfort into an empty fortress barricaded against the onslaught of a brutal winter.

On September 12, the AMC had closed the hut for the season. Gone were the sum-

Bruce Daube

The "hut" at Lake of the Clouds, where the cloud team spent seven weeks testing cloud acidity with a device they designed and built.

mer staffers and the steady stream of hikers. Gone, too, were the bunk beds and the comfortable accommodations. Team members were now housed in what was called the "refuge room," an austere emergency shelter.

"Stinky, wet and sweaty" is how Daube affectionately describes the place. "The walls were always dripping and there wasn't much light."

Back-packing stoves with meager rations had replaced the hearty home-cooked meals of a few weeks before.

Now, Daube, Lamar, Dodson and Cott stayed at the hut singly or in pairs, and only when a "cloud event" was forthcoming. Then the event was documented hourly, along with information on wind speed, direction, volumes collected and general weather conditions. Each sample was carefully labeled and stored for analysis at Pinkham Notch or the New York Botanical Garden's Institute of Ecosystem Studies at the Mary Flagler Cary Arboretum, in Millbrook, NY, where Dr. Likens had assumed the directorship. The balance of their time was spent at the AMC's Pinkham Notch headquarters, working on the design for an "active" collector or doing research on acid precipitation.

The students did, in fact, build an active collector, designed especially for low-lying foggy areas with a power source available. On the active model, a small fan pulls the moisture through the collection strands. Although there wasn't time for the project team to test the active model extensively, all indications suggest it functions quite well.

September had been dreadfully dry. Exasperated team members, anxious to see if the collector worked, were forced to spray mist into the device from their own atomizer bottles. By the beginning of October, however, "cloud events" had begun to pick up. What's more, preliminary tests produced exhilarating results: not only was the WPI collector functioning beautifully, but comparative tests with the still-in-place collectors the AMC was using indicated that the WPI collector was extremely successful in separating rain from cloud water. When there were "cloud events" and no rain, the two collectors showed the same readings. But when there were clouds *and* rain, the two varied considerably, clearly indicating that the WPI collector, with its greater rain-separating capacity, was indeed providing the more accurate measurements.

"Our collector survived some really severe wind gusts," says Daube, "and still produced reliable readings."

By the third week in October, the weather had taken a definite turn toward winter. Rime ice, formed when cloud water freezes immediately upon contact with an object, had begun to interfere with the collection of samples.

The WPI collector was dismantled and hauled down the mountainside. Goodbyes were said to Ken Kimball and the others at Pinkham Notch. The students returned to Worcester. Reports were written.

Then, weeks later, came the word.

Dr. Likens and Dr. Bormann had offered Daube and Lamar a $10,000 grant to build 12 more collectors—two passive and ten active—to be placed throughout the Northern Hemisphere to test acid-cloud content.

One of the spots will again be Lakes of the Clouds. Daube, who plans to attend graduate school in the fall, will be hired by the AMC to tend the collectors there.

"We're extremely impressed with the WPI collector," says Dr. Likens. "We hope it will play an important part in our future research."

The $10,000 to Daube and Lamar is part of a larger, multi-year grant awarded to Likens and Bormann—who, in 1963, authored the first paper on acid rain ever published in the United States—by the Andrew W. Mellon Foundation.

Adds Kimball of the AMC: "The students' design was a major improvement, a tremendous push forward. They've helped us develop the technology. We'll continue to work on the research."

The Likens-Bormann study will, for the most part, rely on the active rather than passive model in an effort to standardize measurement techniques.

While preliminary tests indicate that clouds may be as much as 50 times more acidic than the rain that falls from them, Kimball and Likens stress that years of research will be needed before definitive results can be determined.

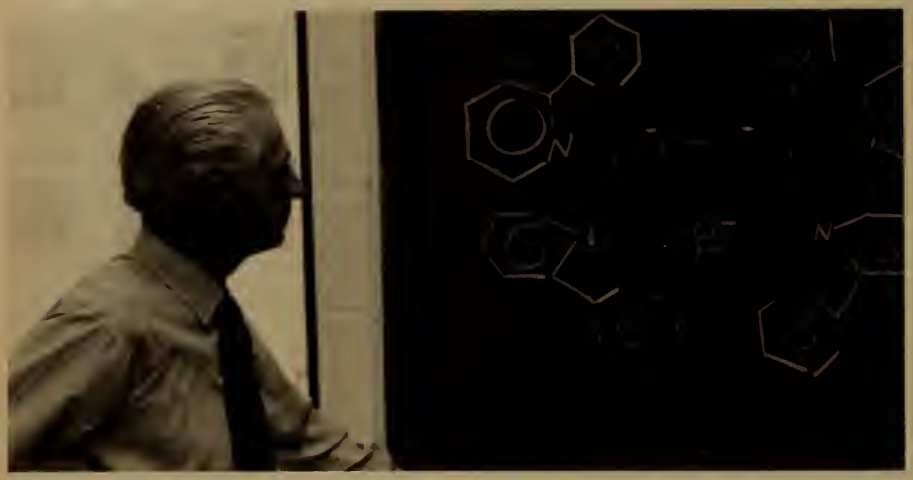
But for some, the rewards are more immediate. To design and build a workable instrument such as a cloud-water collector affords a tremendous amount of personal satisfaction. And to be asked to provide the hardware for a major study conducted by two internationally recognized researchers is an accomplishment of more than passing note.

"I can't say enough about this project," beamed advisor Bob Wagner recently. "It's of the highest quality, and it's what the WPI project program is all about." That said, he can't help but add: "I'm on Cloud Nine."

Michael Shanley is a writer with the WPI News Bureau.

Dr. Arthur Martell, '38:

His Distinguished Career Goes On



Dr. Arthur Martell: "Mr. Coordination Chemistry."

By Ruth Trask

"If I were to advise undergraduate students in chemistry about what path to take, I'd tell them that the future belongs to research," says Dr. Arthur E. Martell, '38 CH, Distinguished Professor of Chemistry and former department head at Texas A&M University.

Regarded by most chemists as the foremost American research scientist of aqueous coordination equilibria, Dr. Martell says research benefits not only the individual researcher, but also chemistry itself and, ultimately, society as a whole.

Dr. Martell knows whereof he speaks. His research has had a tremendous effect upon understanding the behavior of metal ions and ligands in aqueous solution. His work has explained many coordination trends now used in designing metal ligands for biological and environmental applications.

Since stepping down as head of A&M's department of chemistry in 1980, Dr. Martell has continued his research and is teaching courses in bioinorganic chemistry and inorganic-reaction mechanisms. His wide-ranging research centers on developing models for copper proteins, exploring how metal ions and chelates catalyze solvolysis, understanding oxidation reactions in solution and examining how metal ions catalyze biochemical reactions.

Dr. Martell's love for coordination chemistry was evident early in his career. Over the years, he has become known in professional circles as "Mr. Coordination Chemistry."

In 1952, he and a Berkeley colleague, Nobel Laureate Melvin Calvin, published *Chemistry of the Metal Chelate Compounds* (Prentice-Hall), a classic in its field. In 1959, he co-published *Organic Sequestering Agents.* In 1981, he edited the American Chemistry Society (ACS) publication *Coordination Chemistry in Biology and Medicine* and *Development of Iron Chelators for Clinical Use* (Elsevier). Author of nearly 350 journal articles on equilibria, kinetics and physical properties of metal chelate compounds, he is also founding editor of the *Journal of Coordination Chemistry.*

Dr. Martell holds a PhD from NYU and an honorary doctorate from WPI. A former head of the chemistry department at Illinois Institute of Technology (1961–66), he taught at Clark University from 1942 to 1961. While at Clark, where he was department chairman from 1959 to 1961, he helped develop EDTA—which, among its many applications, is an effective agent for the removal of radioactive contamination. "Persons contaminated with fallout from an atomic bomb attack could use EDTA to wash away radioactive material from their skin or clothing," he explains.

Dr. Martell has lectured widely before professional societies and at universities around the world. He has also consulted for a number of companies, including Dow Chemical Co., Pfizer, Stauffer Chemical and Kennecott Copper.

He has been a Guggenheim Fellow (1954–55), a National Science Foundation Senior Fellow of the School for Advanced Studies, MIT (1959–60) and a National Institutes of Health Fellow, U.C. Berkeley (1964–65). In 1980 he won the ACS award for distinguished service in research to inorganic chemistry. In addition, he has received a faculty research award sponsored by the Texas A&M Association of Former Students.

Under Dr. Martell's leadership, the Texas A&M chemistry department came from virtually nowhere to become one of the leading departments in the country. In 1966, when he joined the university, the department had only 23 faculty. Today, there are more than 60, and research funds have increased tenfold to $5.5 million. His administrative efforts also resulted in new buildings for graduate research and undergraduate instruction.

Insistent that the A&M chemistry department serve the entire area, he fostered strong ties with industry. The department even teaches chemistry courses "by wire" to a participating industrial firm.

Dr. Martell has not, however, been content with having established a chemical center of excellence in the Southwest. He has also helped develop the chemical community by serving industry, government and academe nationwide. Associates describe him as "one of those rare individuals who has been able to combine a career of administration with one of research and do a phenomenal job at both."

The leading researcher on stability constants of coordination compounds, he has been, say colleagues, "our one, uniquely important star in this entire area."

HOW TO INTERPRET AN ANNUAL REPORT

It was the best of times, it was the worst of times. Whatever the case may be, an annual report makes one fiscal year sound like the last. And both sound successful. To find out if a company is really in the black, a reader must tune in to linguistic clues.

By Mary Ruth Yoe

"And they lived happily ever after." You'll never find that sentence in an annual report. The institutions and corporations that publish such yearly accountings do believe in fairy-tale endings, but they strive to achieve the same effect through more subtle methods. That means you should read an annual report as a piece of literature, carefully, circling the text. Reading between the lines, you may discover the bottom line. (Sometimes skillfully buried.)

The business of America, said Calvin Coolidge, is business. But the business of American corporations is making money. Even nonprofit institutions—such as independent colleges and universities—want to stay solvent. (Rather than sell a product, they make money by building endowments.) And each year brings a fresh flood of annual reports—assuring shareholders and other constituencies that everything is basically OK.

Nevertheless, annual reports almost never mention money.

You can turn to the back of an annual report and find pages crammed with figures and balance sheets, with notes on nonperforming assets, borrowed funds, long-term debts, dividends, and operating expenses. But "money"—the word itself—stays firmly out of the limelight. Up front, the explanatory text that runs between glossy photographs—smiling employees, freshly polished antique equipment, inspirational nature scenes—is dotted with euphemisms for the company's *raison d'être*, its dirty little secret of success: funds, earnings, revenues, cash flow, returns, profits.

On the other side of the ledger, of course, lurk losses. Rather than mention losses directly, most reports write of events "having a negative impact on earnings." A reader in search of red ink soon picks up on clues, like the adverbs "regrettably" and "dis-

The world presented by the annual report is the best of all possible worlds. There are no "problems," only "opportunities."

appointingly." Losses—otherwise known as "downturns" or "substantial write-offs"—are sure to follow.

While most euphemisms found in annual reports have to do with money ("a *very* [italics mine] substantial write-off" translates to a $78.5 million loss after tax benefits), felicitous phrasing can smooth over other pimples on the corporate facade. (Someday, corporations may echo gracefully aging beauties and admit that a few flaws add character.) The world presented by the annual report is the best of all possible worlds. There are no "problems," only "challenges" and "opportunities." When the going gets really rough, there are "significant" or "major" opportunities.

So a company admits that it has not been a good year for the entire industry, which "experienced its most difficult year as profitability was reduced by XX percent." A reminder quickly follows that Company A is an industry leader when it comes to adjusting to adversity: "The Company took a number of decisive actions to help weather the economic downturn and prepare for better results in the future."

Bad things do happen to good companies, and sometimes bad things can even be good news. Enter another use for the euphemism, as when a college president explains to alumni and other friends of Alma Mater just how the institution has garnered a record year in gifts and grants: "This outstanding result was substantially aided by the maturation of 23 bequests." For a bequest to mature, somebody—in this case, 23 somebodies—had to die, or otherwise complete a career.

Another species of euphemism: the welded word. In annual reportage, certain words seldom appear without amplifying mates. A corporation never baldly "takes steps." At the very least, a company may admit to taking "further steps." Better still are "prudent steps," "economically sound steps," or—most purposeful of all—"strategically important steps."

In much the same way, the noun "emphasis" seems to lack emphasis. So it is never used alone. Annual reports speak of "increased emphasis" or "continued emphasis." "Commitments" are almost always "continuing," and "analysis" is "in-depth." Even words that can stand alone take on extra meaning when coupled with a few all-purpose adjectives. Current adjectives of choice: "significant," "substantial," and "enhanced."

Overly enthusiastic users of the all-purpose adjective do run the risk of redundancy. One Ivy League university recently boasted of "the positive enhancements" made possible by a corporate benefactor. If the benefactor hadn't come through, one wonders, would that have meant "negative enhancements"?

Annual reports, like other assembly-line products, change models from year to year. In the early 1980s, corporations fought their way out of a recession, and annual reports picked up on the military metaphor. Another plus: military and sexual metaphor overlap, and every company president knows that Sex Sells. So in a competitive marketplace, corporations and universities have abandoned "planning for the future" in favor of "strategic positioning" or, at the very least, "strategic planning." Companies talk of strategies, aggressive tactics, taking action on several fronts. Products are "developed to *penetrate* [italics mine] the evolving corporate market." There are objectives, advances, alliances, new territories. The action verbs are "deploy" and, when things don't go according to strategic planning, "redeploy."

As a subspecies of annual reports, those produced by colleges and universities are generally less glossy than their corporate counterparts. Love of euphemism prevails, but the tone is slightly different. While corporate reports are often written by anonymous pens, at colleges and universities the task falls most often to either the president or to someone connected with the annual giving campaign.

The three little words most likely to appear on the tombstone of an annual giving officer: "Another Record Year." That headline and its variations—"Contributions Break All Records," "Campaign Raises Record Amount"—sound, over and over, like a broken record. Sometimes the writer will dredge up a synonym, like "all-time high" or "new mark." But the device most often used to convert record-breaking ennui into enthusiasm is the exclamation point—frequently preceded by an excited "ever": "Again, the Highest Ever!" "The most successful fund campaign ever!"

Presidents don't use exclamation points. They emphasize the long view, the fact that education is a *process*. "Discussion of the curriculum is continuing." "Further steps were taken [by whom, the cynic wonders] in the University's program to achieve long-range financial stability." "Dean X and his colleagues are currently engaged in a number of conversations to this end." And, in summation: "Much, however, remains to be done." Since near-term prospects can't be ignored, marketing jargon now shows up in presidential prose. "Suddenly the student is a scarce commodity." Which means that "in an increasingly competitive college marketplace," a college can't afford to have "an insufficient national presence." Send in the direct-mail experts.

For in the final analysis, as one president writes, "Perhaps the most remarkable of G's assets are the students."

Above all, the president is an institutional Pollyanna. He or she accentuates the positive—a university's "traditions of excellence," a phrase that encompasses "excellent faculty," "outstanding students," "dramatic achievements." But the president must also point to challenges: "maintaining a leadership role," "ensuring the continued excellence of its programs," "enhancing our preeminent position."

Finally, to assure supporters that they have picked a winner, even on a tough track, the president often puts in a leader-in-adversity reminder: "Many other schools face greater perils than we do." The bottom line: "Much, however, remains to be done."

ANNUAL REPORT STARTER KIT

You, too, can write an annual report. (Though why you'd want to is another subject.) Fourscore verbs, adverbs, adjectives, and nouns, culled from state-of-the-art annual reports, await your ventures.

Simply pretend that you are dining at a Chinese-American restaurant and pick one from Column A, one from Column B, and so on. With experience, you'll be able to string two or more nouns together ("profitability options," "growth postures," "progress enhancement initiatives"). Adjectives also benefit from such coupling ("strategic near-term," "sophisticated evolutionary," "continuing competitive").

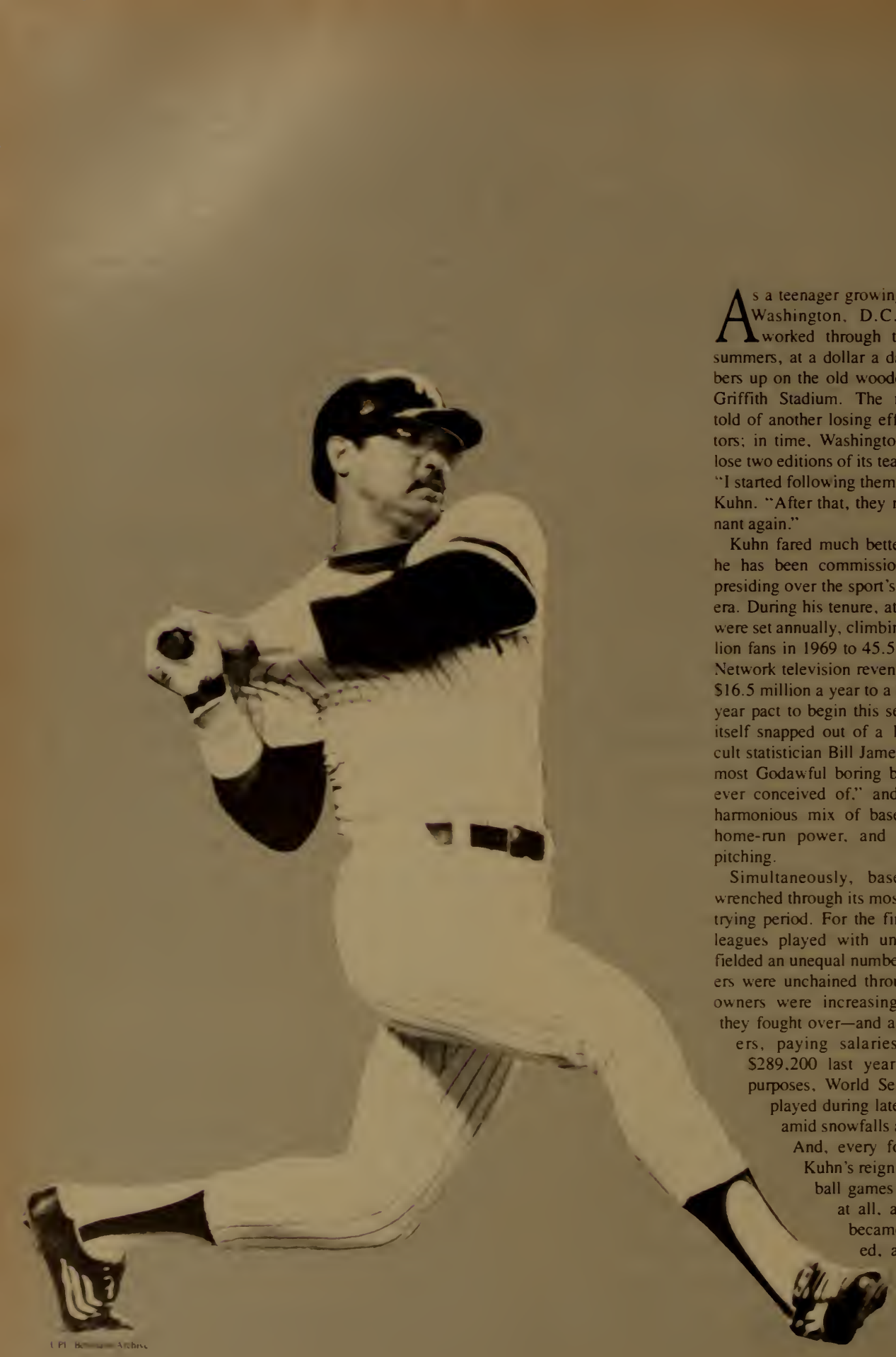
A more fundamentally integrated utilization: Shareholders can consult the chart to evaluate the mainstream positioning of their companies' strategic public relations efforts.

*The most important verb is, of course, *to be;* and the past perfect, *has been*, is a virtually invaluable form: "The Company has been an actively flexible organization, able to anticipate the challenges of its highly competitive environment and thus to position itself creatively for significant long-term high-growth challenges."

The passive voice, in all its variations, is key. While it may not seem to complement the active image sought by the typical corporation or institution, creatively positioned the passive voice has its utilizations. Most importantly, it allows a corporation or its officers to escape out-and-out responsibility: "Disappointingly, profitability has been impacted by the downward pressures of increasingly negative near-term markets."

**In deploying a noun, you should remember that more is more, and try to implement plurals over singulars, thus maintaining a synergistic posture of expanding option packages.

VERBS*	ADVERBS	ADJECTIVES	NOUNS**
Impact	Considerably	Integrated	Action
Enhance	Virtually	Competitive	Change
Restructure	Significantly	Substantial	Progress
Position	Substantially	Strategic	Initiatives
Deploy	Fundamentally	Significant	Options
Redeploy	Aggressively	Flexible	Strategy
Implement	Increasingly	High-growth	Profitability
Complement	Greatly	Long-term	Utilization
Seek	Actively	Evolutionary	Positioning
Finalize	Relatively	Near-term	Expenditures
Outperform	Highly	Sophisticated	Advances
Maintain	Ultimately	Invaluable	Growth
Anticipate	Adversely	Negative	Challenges
Initiate	Creatively	Continuing	Postures
Sustain	Vigorously	Responsive	Enhancement
Explore	Sufficiently	Synergistic	Infrastructures
Reconfigure	Intensively	Extraordinary	Excellence
Expand	Positively	Key	Ventures
Participate	Importantly	Outstanding	Packages
Respond	Imaginatively	Mainstream	Opportunity



As a teenager growing up in suburban Washington, D.C., Bowie Kuhn worked through the city's humid summers, at a dollar a day, putting numbers up on the old wooden scoreboard of Griffith Stadium. The numbers usually told of another losing effort by the Senators; in time, Washington would ignobly lose two editions of its team to other cities. "I started following them in 1933," recalls Kuhn. "After that, they never won a pennant again."

Kuhn fared much better. For 15 years, he has been commissioner of baseball, presiding over the sport's most prosperous era. During his tenure, attendance records were set annually, climbing from 22.6 million fans in 1969 to 45.5 million in 1983. Network television revenues jumped from $16.5 million a year to a $1.2-billion, six-year pact to begin this season. The game itself snapped out of a 1960s torpor that cult statistician Bill James has called "the most Godawful boring brand of baseball ever conceived of," and evolved into a harmonious mix of base-running speed, home-run power, and dominant relief pitching.

Simultaneously, baseball has been wrenched through its most tumultuous and trying period. For the first time, the two leagues played with unequal rules and fielded an unequal number of teams. Players were unchained through free agency; owners were increasingly unbridled as they fought over—and against—the players, paying salaries that averaged $289,200 last year. For television purposes, World Series games were played during late October nights, amid snowfalls and chilly winds. And, every four years during Kuhn's reign, scheduled baseball games were not played at all, as labor relations became worn and frayed, and finally came wholly apart in the unhappy summer of 1981, when

Baltimore News American

The great American game: Opening day at Washington's Griffith Stadium, 1927. The hometown Senators marched with the band; 53 years later, Reggie Jackson—a free agent playing for the highest bidder—hit his 400th homer, for the New York Yankees.

THE GOOD OF THE GAME

The game is baseball, and as commissioner of the game for the past 15 years, Bowie Kuhn has helped the sport enter the world of big business. Along the way, Kuhn laments, he has given up some of his fanhood.

By Eric Garland

a strike cancelled one-third of the season.

Throughout, Kuhn acted as chief executive to a sport uneasily become an industry. His relations to management—the owners—were never well defined; he was at once taskmaster and servant. He voided trades, fined and suspended owners, even forced lineup changes. (When Henry Aaron was about to break Babe Ruth's home-run record at the start of the 1974 season, Kuhn ordered the Atlanta Braves to play him in two of the team's first three road games, instead of allowing the owner to hold Aaron out for a lucrative home date.) His powers were virtually unlimited, according to a 1977 federal-court decision that upheld his banning of high-priced player sales. Yet four years later, another federal court heard an owners' attorney testify, and Kuhn concur, that the commissioner had no status in labor negotiations.

Baseball "is not a ship that turns easily," Kuhn remarks. He takes direct credit for only a few changes in its course. Night World Series games he calls "my baby." Much of his work has been done behind the scenes, he says, in tandem with the owners. "Overall, I feel I've had a lot of influence on where the game is going." *The Sporting News*, the weekly publication regarded as baseball's bible, agrees. In January its editors named Kuhn the 1983 "Man of the Year" in sports, commending him as "the steward of the game in a revolutionary time, and a good one." The award came a few months after Kuhn's dismissal as commissioner had been sealed, and one year after the paper had pressed for his resignation. Like much of the baseball world, they had come to praise Kuhn, once they had buried him.

That Kuhn, now 57, lasted 15 years in baseball's top post is regarded as a triumph. His tenure is second only to that of the first commissioner, Judge Kenesaw Mountain Landis. Brought into the scandal-ridden game in 1921 to instill order, Landis did so emphatically for 24 years. He was followed by a former governor, a sports columnist, and a retired Air Force

"My natural alignment," says Bowie Kuhn, "is with the umpires."

Baltimore News American

Kuhn swings and misses: He played —and umpired—in a slow-pitch softball game at the University of Virginia.

general. With Kuhn's selection in 1969, the office again wore a legal cloak.

Kuhn had spent his law career with a New York firm that represented many major-league clubs, and he was fresh from negotiating player-pension issues for the National League in 1968. The training would be critical, for he entered the game as it entered the world of big business. The nature of both owner and player was changing swiftly, and labor pains were becoming sharper and more frequent.

On the management side, baseball's long-standing families were ready to give way to a new breed of owner. For decades a wealthy individual—a Thomas Yawkey (of the Boston Red Sox) or a Horace Stoneham (who owned the New York, later the San Francisco, Giants)—had been able to pursue an interest in sports, living as a lord of baseball. In the 1970s and '80s, the tide of dollars overwhelmed such owners, washing away all but one of the 26 club fiefdoms. (A last holdout is penny-pinching Calvin Griffith, alone and in tatters in Minnesota.)

In their place are executives and entrepreneurs from the corporate world. They are well-versed in markets and products: McDonald's hamburgers, Levi's jeans, Seagram's liquor, the *Chicago Tribune*, Doubleday books, and cable super-station WTBS are among the concerns that have picked up baseball teams. Along with their increased sophistication came an increased struggle for Kuhn to keep their minds on the "good of the game," a favored phrase. "There is a danger that the interests of a diversified company may take precedence over the baseball interests," says Kuhn. "We've seen some examples of that."

Without naming names, Kuhn is referring to such sore spots as the attempts by Atlanta's Ted Turner to broadcast the Braves' playoff games on cable, over top of network coverage. Quarrels among owners have heated up as the money at stake has ballooned and as the chances of profits—or, more commonly, losses—have multiplied. "In 1969, I'd say we were fairly close to break-even overall," Kuhn reflects. "Today, industry losses are in the scores of millions."

Such financial pressures, he warns, have created a "win at any price" syndrome among owners. Each new million-dollar contract, whether for players or for local television rights, sets rival owners in motion. "If everybody is more or less breaking even, you're not as apt to be as keenly competitive," Kuhn says of baseball's old order. "Today, because the downside is so big, everybody's scrambling not to be in the big loss position."

Still, many bathers are attracted to this pool of red ink. One reason is that, along with players' salaries, the value of a franchise has risen dramatically. In 1973 the New York Yankees—baseball's most glamorous team, in the largest U.S. market—were sold to George Steinbrenner for $10 million. Last year the Detroit Tigers, without nearly the Yankees' number of championships or fans, were bought by a pizza mogul for a reported $50 million. Kuhn foresees a "land rush" when baseball expands again. "I think you'll be absolutely amazed" by the number of bidders, says Kuhn, even though expansion teams routinely suffer a decade or more of inept play on the field and losses in the front office.

But Kuhn maintains that the new owners coming into the game are not intent on making money. They would rather make headlines. "Baseball owners are the best-known owners in the country," he says. "You get more ink, more attention." And feeding an owner's ego, Kuhn suggests, is more important than fattening his wallet. "When you see a substantial price paid for a team, how much is paid by reason of a cold-blooded analysis of the operating statement, and how much is paid by reason of psychic pressure?"

In the midst of these large egos and large bankrolls, the commissioner has had to speak softly while carrying a big stick. Whenever Kuhn crossed an owner, he knew the action could eventually bring him down: he could be fired by a negative vote from one-fourth of *either* league's owners. When, in the aftermath of Watergate, he gave a two-year suspension to George Steinbrenner for illegal campaign contributions, the Yankee owner began to plot Kuhn's downfall. When he started to push for more sharing of revenues among teams, as the National Football League does, the television-rich New York Mets went against him. And when he approved a split-season scheme in the wake of the 1981 strike, a scheme that kept the Cincinnati Reds—the team with the best overall record—out of the playoffs, that vote went.

Kuhn held his ground, in part, through intense lobbying by his allies. Bob Wirz, a longtime Kuhn assistant, recalls that Edward Bennett Williams, a prominent trial attorney who bought the Baltimore Orioles in 1979, had been "sharply critical of Bowie, especially during the strike." But as Williams was drawn more into baseball's inner circles, says Wirz, "he became better acquainted with the system and more informed, and turned into one of Kuhn's staunch supporters."

In the aftermath of the 1981 strike, however, Kuhn lost out. When his seven-year contract came up for renewal in 1982, several owners were on the warpath. The Mets' Nelson Doubleday told the press that Kuhn "is not a businessman. Baseball

AP Wide World Photos

AP Wide World Photos

Rain—not snow—forced Kuhn (top) to cancel a 1972 World Series night game. At a Capitol Hill cable-copyright hearing (above) in 1981, Kuhn chatted with sometime adversary Ted Turner, owner of the Atlanta Braves—and of cable station WTBS.

needs a leader who can help bail us out of our current financial mess." Four other National League owners—some with lingering grudges, others with freshly received wounds—lined up alongside Doubleday, and Kuhn was toppled.

Through Kuhn's lame-duck year of 1983, the owners stumbled about for a replacement. Meanwhile, Kuhn plugged away, streamlining baseball's hierarchy and putting more order into league decision-making. Baseball's different power centers—its marketing arm, the league presidents' offices, its player relations committee—with offices scattered about Manhattan, were brought under the same roof in the commissioner's building on Park Avenue. The change was not just geographical: lines of authority now flow upward from these bodies to the commissioner. The two leagues are set to vote as one on most issues—including the status of the commissioner (which now requires a majority vote to change).

As the owners continued their search, Kuhn agreed to stay on through March, then through this August. For, finally, after Kuhn had greatly enhanced the commissioner's powers, and after the owners had sweetened the pot from Kuhn's $250,000 annual salary to a reported $400,000, a recruit was signed on—Peter Ueberroth, organizer of the summer Olympics in Los Angeles. "Do I find it ironic?" Kuhn asks of his management shake-up, revisions that left him on the outside. As lawyers say, he answers in the affirmative.

If Kuhn paid heavily for shepherding the owners into the modern era, he suffered also at the hands of the players. In the 1940s the owners had routed player organizing, and the Major League Baseball Players Association had remained little more than a weak house union until the 1967 arrival of Marvin Miller. A former economist and negotiator for the United Steelworkers, Miller's tenure roughly coincided with Kuhn's—and in the eyes of the media, the fans, and, most important, the owners, Miller kept coming out on top. "We've been hornswoggled, and we're going to pay for it," fumed Cardinals owner Gussie Busch after a 1976 settlement engineered largely by Kuhn.

There is an uncommon note of irritation in Kuhn's voice when he talks about Miller, who retired in 1982. Kuhn believes ownership has progressed from a wary relation with the union to a practical, straightforward stance. It's the union that has regressed, he says, to conservatism. He cites its opposition to drug-testing of players, claiming that sports unions "have to participate in that if they're going to be modern and effective."

Under Miller's guidance, the players' association became quite modern and extremely effective, leaving behind a period when the most militant issues included water fountains in the dugouts. As Miller solidified the players and initiated collective bargaining—held every four years to up a new basic agreement—the union began to chip away at the owners and at the commissioner. In 1968 the players came away with a binding arbitration system to handle grievances, which formerly were settled by the commissioner. Then the players struck for the first 13 days of the 1972 season, to win more pension money and salary arbitration.

Their biggest prize came two days be-

UPI/Bettmann Archive

Word on the strike: News crews surround Marvin Miller, the players' representative, as he leaves federal court.

fore Christmas in 1975, when arbitrator Peter Seitz gave them an early present: free agency. Traditionally, a player was bound to his team for perpetuity; if he refused to sign a new contract, the club invoked a "reserve clause" to retain him. Seitz ruled that a player could be held for one year, as the contract language actually stated, but no more. The decision was a tremendous blow to the owners. They had known, of course, that their antitrust protection was eroding; after all, the Supreme Court scores had gotten steadily closer, from 9-0 in 1922 *(Federal Baseball Club of Baltimore v. National League et al.)* to 7-2 in 1953 *(Toolson v. New York Yankees)* to 5-3 in 1972 *(Curt Flood v. Bowie Kuhn et al.)*. But Seitz's decision, they cried, would cause financial tremors and ruin the game.

The following spring, the owners locked the players out of training camps, hoping to roll back the players' gain. Kuhn saw the lockout as a futile gesture. "I opened the camps because I thought the owners were wrong. It was not a popular move, but the players were on the right side of that issue." The union did not argue for complete, chaotic free agency, but for a system that allowed players with six years' seniority to negotiate with several teams if they played out their contract. An agreement was reached, and that fall the first batch of 22 free agents went into the hopper. Twelve emerged with million-dollar contracts.

Over the next four years the owners batted .500 on their predictions. Players' salaries did climb mightily, as their services were sold in a free market. But the game enjoyed its tightest pennant races in years and attendance swelled. Still, Kuhn urged restraint in the face of ever-higher payrolls and expenses; in annual "State of Baseball" messages, he raised the specter of teams unable to compete for high-priced stars. And by the 1980 bargaining session, the owners were set on gaining some compensation for lost free agents. They wanted to penalize the team that signed a free agent by requiring it to give up a player in return; in effect they were asking the players to put the bit between their teeth. The players naturally resisted, and the issue was tabled. It smoldered until 1981, when a bitter strike burned a hole in the middle of the season.

Recalling that episode, Kuhn finds the union in the wrong. "When it got down to negotiations, it became apparent they didn't want to make any concessions. At no time did I think it was a proper strike issue, because the compensation would not be all that grievous." The union was mistaken in calling the strike, Kuhn says, "and they had a hard time getting out of it." Miller calls such a reading of events "balderdash." The owners had dug in beforehand, Miller notes, by taking out a 50-day strike insurance policy with Lloyd's of London. On the 50th day of the strike, after 713 games had been wiped out, Miller says, "the strike was settled on the basis of a proposal I personally made to the owners before it began."

Throughout the strike Kuhn appeared to be in the twilight. His hands were tied by the earlier court testimony that he had no say in labor relations—that such a voice was the province of the owners' players relations committee (PRC). Today Kuhn insists he was able to work behind the scenes, even though "there wasn't a direct line in the corporate management box running up from the PRC to me, as there is now." Whatever the case, he never played a "hole card" to end the strike, as he had promised to *The Sporting News*. Much of the media, and many fans, wondered where baseball's steward was as the game ran aground. And the owners, who had entered the strike full of bravado—one had boasted they would "hang Miller's head on a pole"—had only one place to swing their ax when the season ended.

The strike left an ugly stain on baseball, and the blame put on Kuhn for its duration had to hurt. Kuhn has always named safeguarding the game's integrity and credibility as his top duty. Even when he carried his code of honor to extremes—scolding Jim Bouton for the raucously telling *Ball Four*, banning Willie Mays from official baseball ties over shaking hands for an Atlantic City casino—his critics recognized an overarching will to keep the game clean. An "upright scoutmaster," sports columnist Red Smith called him.

Kuhn's past and bearing do have a touch of starch in them. President of his high school Honor Society and Bank Club, he spent two years in a Naval-officer training program while at Franklin and Marshall College, then went on to Princeton after World War II, and received his law degree from the University of Virginia. He immediately joined the Wall Street law firm of Willkie, Farr, and Gallagher, attracted to its baseball clients and its political heritage.

In his current office, classical music comes from a desk radio. Well-tailored, deep in voice, and usually standing or pacing when he talks to seated visitors, Kuhn can appear the Imperial Commissioner. "I think his 6 feet, 5 inches works against

him," says Wirz, who makes a pitch for an unreported, genuinely affable side of Kuhn.

But if Kuhn comes across to the public as aloof, notes Ken Nigro, a baseball writer for 10 years at the *Baltimore Sun*, it's hardly an accident. "He was very inaccessible to the media," Nigro says. Lacking the public-relations background of football commissioner Pete Rozelle, Kuhn shrugged off a lot of press demands. The silence, Nigro believes, "helped cost him his job."

"I had to take the slings and arrows," Kuhn says, more concerned with working for the good of the game. His solace is that he can pronounce the game good, on the field and in the stands. He calls baseball the "family sport—more women, more children in the ballparks," and he points out that ticket prices have not been grossly inflated. He cheers the teams' greater emphasis on marketing and promotions that bring more and more varied fans into the parks. "I'm sort of sorry we didn't find the San Diego Chicken and the Philly Phanatic 40 years ago," he says, in earnest. "I really enjoy them." He stands behind night World Series games as "a dramatic way to showcase baseball"; and, although he now wishes the leagues would decide together on the fate of the designated hitter, he stands behind it as a necessary experiment in its time.

Baseball as an art form has been another of Kuhn's puzzles in modernism. With issues like the designated hitter and World Series night play, he has had to balance the classical purity of the game against steps taken to widen its appeal. Out-of-sync elements, such as the different number of teams in the two leagues, do concern him; wilder proposals for change are examined coldly. "I believe in the Rip Van Winkle theory," Kuhn told Thomas Boswell in *Inside Sports* in 1980. "A man from 1910 *must* be able to wake up after being asleep for seventy years, walk into a ballpark, and understand baseball perfectly." Still, alterations that could bring in more television, more attendance, and more money are necessarily of interest to him. Interleague play is a warm subject; the expanded playoffs of other sports, once heavily discussed by the American League, are for now "not on the front burner."

Quiet resignation: With only 10 days left on his contract, Bowie Kuhn announced at an August 1983 news conference that he was resigning as baseball commissioner. Promising to stay until a replacement was found, he departs the post this August.

As commissioner of the game for 15 years, Kuhn laments, he has had to give up some of his fanhood. He cannot root for any team. He has little time to pore over the box scores in the *New York Times* and *Daily News* left on his New Jersey front porch each morning. When he attends his 60 to 70 games a year (more of them college, minor-league, and foreign than not) and turns many more on at night on television, he finds himself watching the umpires. "My natural alignment is with them," he says. "They're sort of the commissioners on the field." Yet he still notices the rhythms of the game, and finds it a more interesting, exciting, running game today, with less emphasis on the "big, slow-footed sluggers" of his youth. "The game is a beautifully integrated whole," Kuhn sums up. "All the pieces work."

Nigro says Kuhn will be missed as commissioner because, fittingly enough, he's likely the last one who "really and truly loves baseball. Now it's getting to where everything is business." Indeed, Kuhn's successor, Ueberroth—highly regarded for his financial and organizational talents in building the nation's second-largest travel agency—described himself upon his appointment as "a stranger to baseball" who owned rarely used season tickets to Dodgers games.

After August, Kuhn plans to return to legal work, some related to sports, some not. An avid reader of American history and politics—Washington, Jefferson, and Wendell Willkie, a founder of his old law firm, are favorites—he'll also go back through Roger Angell's *New Yorker* pieces on baseball. "I'll read Roger almost the way I pick up a volume of Robert Frost and go through it," Kuhn says of the writer he calls the "poet laureate of the game."

In turn, Angell—like almost everyone else, of mixed feelings about Kuhn—wrote in 1969 that "he may be the best thing that has happened to baseball since the catcher's mitt," a commissioner who could "force baseball's Cro-Magnons into common sense planning and grudging contemporaneity." Upon Kuhn's exit, Angell was brief and somber. "Mr. Kuhn is a pleasant and hardworking gent, with a deep love of the game," he observed, "and I think he has been ill-used by his employers." Knowing the score, Kuhn simply says he'll miss the game and the people in it.

Eric Garland, a writer at Baltimore Magazine, *is a Pittsburgh Pirates fan.*

COUNTING DOWN THE TOP TEN

As these brief biographies show, all numbers were not created equal. Some rate as stars, the author argues, while others remain in the background. Why? The answers lie in mathematics, science, religion, and folklore. And the Top Ten turns into the Top Eleven.

By Robert Kanigel

Illustrations by Robert Soulé

9 When the Beatles released *The White Album* in 1968, the number Nine came in for an unaccustomed taste of celebrity: One of the songs on that untitled LP classic ended with a strange, hypnotic mantra—"Number nine . . . number nine . . . number nine . . ."—that has kept fans and critics wondering ever since.

Until then, Nine's reputation had rested largely on its being not-quite-Ten: In expressions like "Possession is nine points of the law," or "nine times out of ten," Nine carries the flavor of something almost true but not quite, of something missing, incomplete. The bowling game known as ninepins? "Tenpins without the head pin," is how one dictionary defines it. This same almost-Ten quality has been exploited commercially—as in a sale price of $69.99, say, where the Nines disguise the 70 dollars an item really costs.

To the early medieval mind, at least, Nine was perfect: It was Three times Three, the product of the perfect triad (with all its Christian symbolism) times itself. Nine—which may owe its graphic form to the Greek letter *theta* (θ), once used to denote it—is the number of Muses of the ancient Greeks and the number of rivers in the classical hell. It is the number of Etruscan gods whose worship was introduced to Rome, the number of heads on the mythological Hydra. The number of lives folklore attributes to cats, it can claim a modest contribution to sports jargon as well: "a nine" can be a baseball team, or half a standard round of golf.

Aside from these claims to distinction, Nine has little to recommend it.

8 When human beings make things, they make them with Eights.

It is, as it were, a secular number, largely barren of religious or symbolic significance. Eight is the crew of oarsmen on a racing boat, the number of slices in the standard pizza. It is an automobile engine of that many cylinders, the number of squares in each chessboard row, of reindeer powering Santa's sleigh. It is the number of triplets of broken and unbroken lines that the ancient Chinese used to form the 64 trigrams of the *I Ching*.

If you keep dividing a measuring scale in halves, pretty soon you're down to eighths. So it is in eighth-dollars, not dollars and cents, that Wall Street records stock prices. Inches are divvied up into eighths, musical time into eighth notes. In navigation, compass direction is traditionally reckoned in eighths of a point—a point being one-eighth of a quarter circle, or about 11 degrees.

Students of computers learn that eight bits, the fundamental unit of information, make a byte. (A bit is the information you have when you know that a switch that may be On or Off is actually one or the other.) Eight bits can represent 2^8, or 256 possible combinations, which is enough to give unique on-off codes to each number, letter of the alphabet, and punctuation mark—and enough, in the early days of computers, to get eight bits its own name.

Keep halving and you get eighths; keep doubling and you get eights. And double is just what computer memories, which are figured in so many "K," or thousand bytes of capacity, do with each new generation; almost invariably they're rated in multiples of 8K. A capacity of 10K or 12K or 18K is rare, one of 8K, 16K, or 64K the rule.

When it comes to symbolic significance, Eight's claim is thin. One survey of the otherwise rich tradition of Jewish numerology, for example, notes that Eight, like Nine, "does not appear to have any

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intrinsic symbolic import." The few mentions of an eighth day in the Old Testament stem from its proximity to the more significant seventh day. And the term "eighth wonder" refers to a marvel not itself one of the *real* Seven Wonders of the World.

Even as the span, in hours, of the "normal" workday, Eight's claim is diluted, the eight-hour day's hold on modern consciousness doubtless owing as much to the three satisfyingly equal parts into which the day's 24 hours conveniently divide.

5 Among the Tamanac Indians of the Orinoco River basin, Five is *amgnaitone*, meaning "one hand complete." Similarly, the Roman symbol for Five, V, was most likely a hieroglyph for an uplifted open hand: One stroke represented the thumb, the other the four fingers together. The U and the inverted V that stood for Five on early Roman monuments can be likewise visualized.

Five is inextricably linked to the five fingers of the hand. But humans have two hands and ten fingers, so that Five has, like Nine but for different reasons, lived in Ten's shadow. Most cultures picked both hands—Ten—as the basis of their number systems. Some, like the Celts, settled on hands *and* feet—Twenty. Even today, the French word for eighty is *quatre-vingts* or "four 20s." A very few, including several African tribes found by the explorer Stanley, have used "quinary," or base five, systems. Homer used the Greek word for Five as a verb, "to count," but apparently the Greeks employed a true decimal system in which Five merely served as a natural halting place, halfway up from units to tens—just as grade schoolers today singsong, "Five, ten, fifteen, twenty."

In ancient times, Five was often used for "a few." Some scholars, for instance, read the "five smooth stones" that the biblical David chose for slinging at Goliath as merely "several" stones.

Followers of the Greek mathematician Pythagoras believed that in numbers lay the key to all manner of cosmic mysteries. To the Pythagoreans, Five stood for marriage because it was the sum of the first feminine number, Two, and the first masculine number, which was not One but Three. It was also "circular" because, like Six, it forever reproduced its last digit when raised to any power: Five squared is 25, cubed is 125, to the fourth is 625, and so on.

Words owing their origins to Five include *quintessential,* which refers to a higher "fifth essence" beyond the basic four "essences" of the Greeks (earth, air, fire, and water). And the *punch* served at parties: During the 17th century, the English took a liking to an East Indian drink made from water, sugar, lemon juice, spice, and arrak, a strong alcoholic beverage made from rice or molasses. The ingredients numbered five, which in Sanskrit is *panca.*

6 The "Six Counties" constitute Northern Ireland. Six "companies," or family clans, are said to run San Francisco's Mafia. The "six-shooter" put many an Old West gunslinger "six feet under." The modern university calendar's *semester* derives from the Latin *sex* and *menstris,* meaning "six months." A sixth sense suggests powers of perception beyond the ordinary five. In the old 12-hour day that ran from sunrise to sunset, the sixth hour—*siesta* in Spanish—was reserved for midday naps. Ocean depth is measured in fathoms of six feet. (On the Mississippi, "mark twain" was 12 feet.) The six-sided benzene ring functions as the skeleton for many organic molecules. Snow crystals are six-sided. So are the waxy cells of a beehive.

Six. The Pythagoreans called it the "perfect number," since it was both product and sum of Three and Two and One. But let's face it, Six's real significance may derive from its role as an ambassador, as it were, from the Twelve-based duodecimal system, where it plays a role analogous to that played by Five in the decimal system.

12 Whether as the sum of ten-digits-plus-two hands, or else as the number of phalanges, or finger segments, on each hand, Twelve has always made for special convenience in counting. And it can be divided by 2, 3, 4, or 6, whereas 10 is divisible only by 2 and 5. In any case, Twelve long ago took on mystic significance as a round number. Homer tells us that Ajax and Odysseus each commanded 12 ships, that 12 Ionian cities formed an alliance. Israel, says the Old Testament, had 12 tribes; Christ, according to the New, had 12 disciples.

In commerce, everything from eggs to T-shirts is still counted by dozens and fractions of dozens, rather than by tens. Four bottles of aspirin on a pharmaceutical supplier's order form are still apt to be recorded as one-third dozen. Doughnuts are sold by the dozen, as are file folders, erasers, and tent pegs. Photographic film typically comes in 12-, 24-, or 36-exposure rolls. Beer is sold in six-packs, or in cases of two dozen—never by tens. (But seltzer, where still available in real siphon bottles, comes in cases of ten; so do computer diskettes.)

The jury of twelve is sacred to our judicial system; proposals to reduce its size have gained but scant success. What little orderliness the English system of measurement boasts can also be traced to Twelve: Twelve inches make a foot, 12 troy ounces an old English pound, 12 pence an old English shilling.

A dozen dozens, of course, equals a gross. But did you know that a dozen gross—1,728 or the duodecimal equivalent of 1,000—has been called a "mass"?

Woolworth's didn't make it as a "six and twelve," but multiples of Six—12, 60, 120, and even 360—continue to give decimal systems a run for their money.

4 If you ask a member of certain primitive tribes how many cattle he owns, the reply, should he own more than three, is apt to be simply, "Many."

Four is a transitional number. A number may be squared or cubed, but never "fourthed." We say "once," "twice," or "thrice"—but never "fource." In 1921, psychologist A. Descoeudres went so far as to describe what she called the *un, deux, trois, beaucoup* phenomenon: A preschooler's ability to determine number appears to break down rather abruptly, with numbers greater than three becoming simply "a lot."

A Czech says, "Two and two are four," but, "Two and three *is* five." To Karl Menninger, author of *Number Words and Number Symbols*, this type of linguistic evidence hints that past a certain point in a counting sequence, numbers become things of their own, are no longer merely appendages of the things they modify. For Menninger, Four frequently occupies this transitional point. Some psychological test results even suggest that the brain sees small numbers as distinct entities—as *threeness* or *fourness*—in the same way it sees, say, *cowness*.

Four is the number of nucleotide bases making up the genetic code, the number of questions Jewish youngsters ritually ask (and the number of cups of wine ritually consumed) at the Passover seder, the number of leaves on a clover said to bring good luck. And, perhaps, if recent formulations of subatomic structure are right, the number of "flavors," or varieties, of quark.

The Pythagoreans regarded Four as the number of justice, because it was a perfect square, symmetrical, neatly divisible into equal parts. "Foursquare" means sound, frank, honest. 4-H Club members extol head, heart, hands, and health. And there's even something morally upright and solid about four-poster beds.

In "Inventory," Dorothy Parker, that master of light verse, had this contribution to make to the literature of Four:

> Four be the things I am wiser to know:
> Idleness, sorrow, a friend, and a foe.
> Four be the things I'd be better without:
> Love, curiosity, freckles, and doubt.

7 Seven works a spell.

The Egyptians had Seven Spirits, the Hindus Seven Devas. There are seven deadly sins, seven champions of Christendom. Japanese folklore speaks of Seven Gods of Happiness. Cabalists tell of seven abodes of bliss—the last of these being "Seventh Heaven," the abode of God and the highest angels. (The Koran speaks of seven levels of hell.) A "seventh son" is said to be gifted with occult powers. *The Revelation of St. John the Divine*, in the New Testament, mentions seven stars, seven angels, seven candlesticks, seven spirits of God, and "a book . . . sealed with seven seals"—from which Ingmar Bergman's film, *The Seventh Seal*, took its name.

Nor is Seven-clustering confined to the realm of the spirit. There are seven liberal arts, seven days in the week, seven notes in the musical scale, seven seas. In *As You Like It*, Shakespeare surveyed "seven ages of man." Students of adult development find evidence that life-cycle stages tend to last about seven years—a figure resonating with the folklore of the "seven-year itch." And the "Seven Sisters" can, depending upon the context, refer to a rose, a cactus, a constellation, a select group of women's colleges, a set of antitrust laws enacted by

Woodrow Wilson when he was New Jersey governor, or to seven cannon used by the Scots against the English at Flodden Field. Nineteenth-century critic John Ruskin called one of his tomes *The Seven Lamps of Architecture*. Why seven? Apparently because it *sounded* right. In a note to a later edition, he confessed he'd had trouble "keeping my Seven Lamps from becoming Eight—or Nine—or even quite a vulgar row of foot lights."

Something in the human mind, it seems, loves nothing so much as to group things by sevens. Indeed, in memory-span tests, people seem able to recall just about seven digits (telephone numbers, for example), seven letters or seven random words. The result is so predictable, the number so recurrent, that psychologist George Miller devoted a paper to the phenomenon, "The Magical Number Seven, Plus or Minus Two." "I have been persecuted by an integer," he wrote. "For seven years this number has followed me around, has intruded in my most private data, and has assaulted me from the pages of our most public journals. [There is] a design behind it, some pattern governing its appearances."

Why Seven's hold on the imagination? Why was it considered sacred by Egyptians, Assyrians, Persians, and the Vedic people of India, to name just a few? Some say it derives from worship of the seven ancient heavenly bodies—sun, moon, and the five then-known planets. Others point out that Seven is composed of numbers Three and Four, themselves considered sacred. Perhaps more telling is that Seven has so few ties to any of the other digits, is a multiple of none of them, stands alone.

"Seven is a good handy figure in its way, picturesque, with a savor of the mythical," Thomas Mann wrote in *The Magic Mountain*. "One might say that it is more filling to the spirit than a dull academic half dozen."

Inscribed on the wall of a temple near Gwalior in central India appears a zero. A particular flower garden was to be 270 units long; the 270 is recognizable even today. Recorded nine centuries after Christ, that zero is the earliest such marking ever found.

No zero figures in the original Babylonian sexagesimal system. Theirs was like ours in that the equivalent of 77 meant seven tens plus seven units. But lacking a zero, 707 would be written, say, like 770; the context, presumably, determined which applied. Around 300 B.C. appeared a new symbol—two small slanted wedges: It could indicate something missing within a number, but couldn't distinguish between, say, 770 and 77.

In its early forms, the first true zero was closer to a dot—perhaps the source of our ellipsis (. . .), the symbol used to indicate omitted text. The zero symbol may be an abbreviation for the Greek word *ouden*, meaning "nothing." The word zero goes back to the Arabic *sifr*, "empty"—which is also the source of our "cipher," which can be used to mean a "nothing" of a person, a nonentity.

The destruction wrought by a bomb is typically measured at various distances from "Ground Zero." More generally, Zero represents the point from which reckoning begins. It can be, and often is, arbitrary. Thus, Zero on the Celsius scale is simply the temperature at which water freezes; below Zero lies a whole range of minus values. Thermodynamics calculations use the less arbitrary Kelvin scale, based on an "absolute zero" at which all molecular motion ceases.

"Formal instruction is necessary for the development of a true understanding of Zero as a number," conclude Rochel Gelman and C.R. Gallistel in *The Child's Understanding of Number;* to the average child, in other words, Zero represents an intellectual obstacle. "The historical record ... makes it clear that the human mind is loath to include Zero with the other representations of numerosity," they write; it was not accepted as a number in Western culture until the Renaissance.

And not completely, it seems, even then. Wrote one educated Frenchman in the 15th century: "Just as the rag doll wanted to be an eagle, the donkey a lion, and the monkey a queen, the *cifra* put on airs and pretended to be a digit."

Computers store and manipulate information through a network of electronic "gates." Each can be either closed—represented by a Zero—or opened—by a One. Such a binary, or base two, number system was first introduced to the West by the German mathematician Leibniz in 1703. Though "regarded with the greatest affection by its inventor . . . it appears," as one account

has it, "to have been received with entire indifference" by everyone else. Crude forms of a binary system are known among certain Australian and Polynesian tribes. In New Guinea, for example, *urapun* is One, *okosa* Two. Five is *okosa okosa urapun*, meaning two-two-one. And so on.

In *The Soul of a New Machine*, Tracy Kidder tells how the computer whose development he chronicles "took its first material form on paper—in a fat volume of pages filled up with line after line of 0's and 1's." Today the binary system is ubiquitous, and the symbols 0 and 1 often serve as symbols for Off and On.

Off, or On. Yes, or No. This way, or that. Opposites, contradictions, ambivalence—this is Two territory.

Two's great virtue is that it ends the loneliness of One, as in the bonds of marriage or, more generally, the act of coupling. "Two are an army against one." "One's two few, three too many." "Two in distress make sorrow less." All these reflect the happy grouping Two can be. Two is a back-up, a precaution against the loss of one. Most of the organs of the body occur in pairs, kidneys and lungs as well as hands and feet. Two is Yin and Yang, male and female, the number of fruitful cooperation: "Two heads are better than one."

But there's another, troubling side to Two; the cooperation isn't always fruitful, the coupling not always happy. "Two dogs seldom agree over one bone," goes the old saw. "It takes two to make a quarrel," runs another. Two speaks of irreconcilable opposites, of black and white, of the hostile lawyer's relentless insistence on a "yes or no answer." Indeed, Two in German is *zwei*, derived from the same root as *Zwist*, which means strife or discord. Our words despair, dispute, and even duel are all, distantly and etymologically, Two-words.

During the early medieval period, Two was actually regarded as evil, writes Christopher Butler in *Number Symbolism*, in part because it "represents divisibility, a breaking away from unity." Two cries out, it would seem, to be rid of part of itself and so achieve Oneness, or else for a third to join it. Either way, it is potentially incomplete or unstable. It is the Hegelian dialectic of Thesis and Antithesis without the higher Synthesis that can resolve its tensions and contradictions.

Two is the number of ambivalence, of "two sides to every coin." It delivers a one-two punch, leaves one "waiting for the other shoe to drop," the ironic or bittersweet twist: "Two lawyers can live in a town where one cannot." Or, as in this from George Bernard Shaw, "There are two tragedies in life: One is not to get your heart's desire. The other is to get it."

Two is a number on edge, ill at ease. Is it even—as in second class, Second City, second best—insecure?

3

No matter that Aramis, Athos, Porthos, and D'Artagnan come, in all, to four—Dumas called his account of their adventures *The Three Musketeers*.

Both Seven and Three make for natural groupings, but whereas groups of Seven evoke the mystical, groups of Three seem satisfying and complete, suggestive of a beginning, middle, and end. *All guten Dinge sind drei*, say the Germans: "All good things are three."

Gaul was divided into three parts. The blind mice of the nursery rhyme number three. Voltaire, in *Candide*, spoke of three great evils: boredom, vice, and need. Critic John Ruskin counted three things people need to be happy at work ("They must be fit for it . . . not do too much of it . . . have a sense of success in it.") The Talmud is replete with folkloric trinities, like the three weakening agents (fear, travel, sin), or the three maladies remedied by the consumption of dates (a troubled mind, constipation, and hemorrhoids). Platform speakers learn to leave their audiences with three main points. And writers know, or sense, the natural rhythm of threes, as in "a loaf of bread, a jug of wine, and thou." (Three also gives us our word "trivial." Of the original seven liberal arts, four were grouped together as the *quadrivium*, for which the *trivium* of grammar, rhetoric, and dialectic was the basic, easily mastered prerequisite.)

In antiquity, pagan peoples worshipped triads of gods. In Babylonia, they were Ana, Bel, and Ea, and in Egypt, Isis, Osiris, and Horus. The universe was divided into heaven, earth, and the abyss, and the three deities each ruled one division. On this historical scale, the Christian Trinity comes late. (The term itself was introduced by Tertullian, about 270 A.D.) One scholar of number symbolism, V.F.

Hopper, sees the Trinity as an outgrowth of Pythagorean thought: "The presence of divine triads in all the Gnostic creeds was certainly a determining factor in the creation of the Trinity, but the underlying Pythagorean basis of contemporary philosophy necessitated the doctrine. That the Father and Son were one was questionable upon numerical as well as philosophical grounds. But Father, Son, and Holy Spirit were unquestionably One by very virtue of being Three."

In the Pythagorean view, Three—not One or Two—was the first real number, because it suggested the triangle, the first plane figure. (Any polygon, for example, can be broken into triangles; such triangulation is a means of surveying and navigating.) The Pythagorean three-phase creation story, incidentally, shows clear ties to the Hegelian dialectic of Thesis, Antithesis, and Synthesis: First, a kind of undifferentiated Unity; then its separation into two opposing powers to create the world order; finally, the union of those opposites to generate life.

To be sure, Three's aura of sufficiency has been known to get out of hand. The expression "The Three Tailors of Tooley Street," for example, refers to any small body of men who claim to represent many—from their petition to Parliament that began, "We, the People of England . . ."

1 Is One a real number?

Euclid didn't think so. Neither did the Pythagoreans, although for them it was the divine source of all numbers. In the Middle Ages, One was described as *radix universi numeri et extra numerum,* meaning "the root of every number and yet itself no number."

English distinguishes between One and "an" or "a." The Germans, in most of their dialects, do not; High German "can convey the numerical sense of *ein* ('one') only by inflection in speech," writes Karl Menninger in *Number Words and Number Symbols.* One's problem, he goes on, is that it "conceals within itself no plurality which it collects together into unity, and since it is in this that the essence of number lies, [by this thinking One] is not a number." It took a Renaissance mathematician named Stevin to prove it was: Take any number from a given number and the latter decreases; to this rule, One was no exception, thus qualifying as a true number.

"One is the loneliest number," as the song lyric says. Yet One suggests, too, the proud, self-reliant individual—complete unto himself, alone against Fate, or the odds, or society—a romantic, robustly American type. The two images fuse in the "loneliness of command" of the ship's captain, or in Gary Cooper defending his town alone in *High Noon.*

Despite the price it exacts, One remains highly coveted. To be Number One is longed for by athletic teams, corporate executives, and Nobel-seeking scientists alike. One suggests purity, something even more perfectly refined than the "99 and 44/100ths percent pure" of the old Ivory soap commercials. Sex, at its best, fuses Two into One, achieves oneness or union. This ultimate One is the goal, too, of scientists, philosophers, and other truth seekers: Today's physicists, for example, have successfully identified the four fundamental forces of nature, yet strive to fashion a unified field theory that will successfully resolve those forces into a single, grand Force.

One's symbolic significance goes back to the earliest societies. One was, to every early culture, the First Cause, the Creator, the Prime Mover. The first monotheists, the Jews, say in the most sacred of their prayers, "Hear, O Israel, the Lord our God, the Lord is One." For the Zuni Indians of the American Southwest, the word for one was *topinte,* meaning "taken to start with." Eastern religions characteristically deny a split among the parts of the universe, subsuming them all under a single cosmic consciousness or Universal Oneness. The Babylonians called their god of heaven *Anu,* "the Divine One." The Egyptians had the same idea, calling their god of heaven *Ra,* "the one One."

All of which can be hard to get a handle on. One is a number, yet unlike other numbers. It encourages paradoxes, as in Ben Jonson's line, "One is more than a multitude." Formulations of spiritual Oneness risk slipping into gibberish. The cosmic amorphousness of One clamors for a volley of Woody Allen one-liners. Everything, One is just one step away from being Nothing.

Robert Kanigel is a Baltimore free-lancer who has written for the Alumni Magazine Consortium on such topics as mentors, the placebo effect, and the Brooklyn Bridge.

GETTING INTO THE ACT

The Alumni Admissions Program gives real meaning to the term "alumni service"—in your own back yard.

By Walter J. Bank, '46 EE

"Sometimes, we actually encourage high school students *not* to apply for admission to WPI," reports one alumni volunteer active in the Alumni Admissions Program.

This, at a time when the number of 18-year-olds is falling fast?

This, when the competition for the upper crust of quality high-school students is straining the recruiting budget of *every* college?

This, in a buyer's market for education?

"Absolutely," says Rene Bertrand, '57 CH, who serves as the Union (New Jersey) area chairman for the program. "We try to turn high-school students' inquiries about WPI into applications for admission. Naturally, we try to steer the best candidates toward WPI, but to encourage a prospective art or anthropology major, for example, to apply would only waste their energies, as well as WPI's—and my—time."

Bertrand is one of some 400 alumni in 31 areas nationwide who are active in the Alumni Admissions Program. The role of these volunteers, says Roy Seaberg, Jr., '56 ME, Director of Admissions, is vital to the college, for Seaberg's professional staff numbers just five. "We count on alumni to provide applicants for admission—more than 2,300 last year—and for the kind of personal contact and cultivation necessary for a viable admissions program."

If current demographic projections come true, by 1992 the number of high-school seniors across the country will dwindle by 25 percent. And the impact on the Northeast will be even more dramatic. The shortfall could reach 40 percent here. For colleges like WPI, which historically has drawn 70 percent of its freshmen from Massachusetts, Rhode Island and Connecticut, such a shift could be disastrous.

Walter J. Bank, '46 EE, heads the Alumni Admissions Program at WPI.

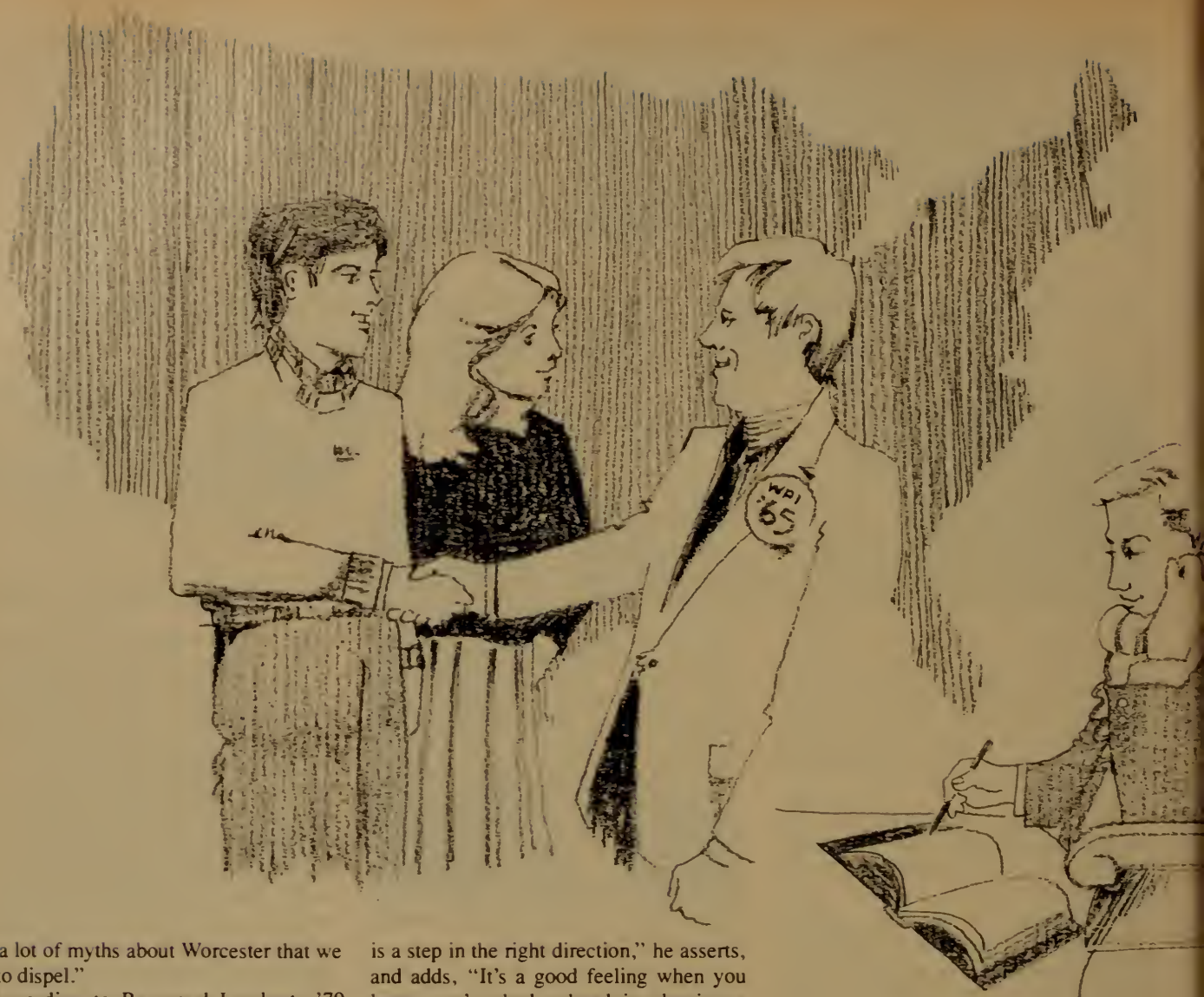
Why not simply recruit more aggressively in the Sun Belt states? ask many. There, the shrinkage will likely be much less significant. Some colleges have resorted to this tactic, but research shows that relatively few 18-year-olds from the South and Southwest are opting for "Snow Belt" colleges, choosing to continue their studies in areas other than in the Northeast.

So, anticipating all this, and rather than throwing good money after bad, the Admissions Office, in conjunction with the Alumni Office, eight years ago initiated a program that brings one of WPI's most enthusiastic and energetic resources—its alumni—into direct and ongoing contact with high-school students who have shown interest in attending WPI. For the first time, alumni became active in the pre-application phase of the year-long recruiting process. Before, they had interviewed only those secondary school students who had already submitted applications.

The new arrangement brought the program more vitality. It also provided greater challenges for alumni—and higher risks for the college. For now, volunteers were on the front line of WPI's recruiting efforts, generating applicants rather than acceptees, responding to the really tough questions about WPI and engineering and science. "So often," says Seaberg, "it's that initial contact, that first impression, that turns an 18-year-old either on or off to a particular college."

"The risk has paid off. No question about it," says Kay Reynolds, Assistant Director of Admissions and Coordinator of the Program. "Here's a way," she says candidly, "for alumni to show their support for WPI in ways other than financial. It takes a special kind of person to dedicate enough time to call or write to the five to ten high-school students we assign to each volunteer."

Plus, she says, many volunteers attend college nights at their local high schools. Here volunteers spread the word about WPI, the Plan, housing and costs, social life and, just as importantly, what it's like to study toward and work at a career in technology or science. "Some students," says one volunteer, "are surprised that they needn't go all the way into Boston—as we used to have to do—for concerts, shopping and other social events. There



are a lot of myths about Worcester that we try to dispel."

According to Raymond Lambert, '79 ME, who is chairman for the Springfield (MA) area, "WPI's educational program strikes many students and their parents as, well, mysterious at first." Parents, especially, he says, are curious about student projects—whether there's faculty guidance, who chooses topics, and whether there's a core curriculum. "The literature we give them and the training we receive from WPI—and, of course, our own experiences—help us answer these inquiries."

Typically, volunteers follow up such encounters with phone calls to students who have shown further interest in WPI or who have been identified by the college or other sources as potential candidates for admission. Lambert has also visited his own high school, sitting down with students to review their applications, to advise them on how to handle the college interview—which WPI recommends strongly for all applicants—and just to chat about WPI. "Anything we can do to make the interview more personal and informal is a step in the right direction," he asserts, and adds, "It's a good feeling when you know you've had a hand in charting a young person's future, and knowing that the college is benefitting, too."

Naturally, says Paige Axtell, not all alumni volunteers studied under the Plan. As Assistant Director of Alumni Relations, she plays an active role in the program and preceded Kay Reynolds as its head. Axtell believes that alumni volunteers are especially well served by the program, for their involvement gives them an extensive overview of what's been happening at WPI since their times here.

"Some of the most successful experiences for alumni," she says, "are attending college nights, acceptance receptions and other events at which some of WPI's most credible resources—its students—give applicants a firsthand idea of what today's WPI educational program is all about."

Dan Coifman, '67 ME, couldn't agree more. He heads the five-member Alumni Admissions Program in Puerto Rico, from which, reports Roy Seaberg, WPI is recruiting students of exceptional quality.

At a San Juan reception for about 30 candidates, Coifman recalls, Fernando Lopez de Victoria, '86 NE, told of his experiences at WPI "with a poise, character and frankness that left everyone—we volunteers included—with a totally new and positive impression of WPI. That kind of support from the college—plus WPI's computerized information system and Kay's newsletters—get us the information we want when we need it."

Angela Ortiz, '87, a biomedical engineering major, met Coifman at one such reception in her native Puerto Rico. As we went to press, she was in the midst of the "Hell Week" pledging activities of Phi Sigma Sigma sorority. But when she met Coifman, she was going through hell trying to decide on a college.

"As I recall," says Coifman, "WPI wasn't Angela's first choice initially." But his follow-up phone calls, reminding her

Sherry Horcanopulos

of WPI's application deadline and simply answering her questions about the college, had something to do with her accepting WPI's offer to enroll.

When Robert Kenny, '87 MGE, of Basking Ridge, NJ, met Les Reynolds, '50 ME (Kay Reynolds's dad, by the way), to talk about WPI, it wasn't at a college night or at a hotel reception, but in the comfort of Les's home, a few blocks from Rob's house. "After I'd applied," Rob remembers, "Mr. Reynolds called and invited me over to talk WPI. The informality of this meeting—unlike interviews with alumni from other schools—impressed me, and Mr. Reynolds was so enthusiastic about his alma mater."

We know from a recent study that involving alumni in student recruitment has a positive impact on the quality of the applicant pool, the geographical distribution of applicants and the overall awareness of WPI among applicants.

The most significant achievements, however, are harder to measure. The personal touch WPI volunteers exhibit to high school students and their parents seems to make a difference. Through their contacts with high school guidance counselors and teachers, alumni have helped to inform these "significant others" in the lives of prospective students of WPI's educational opportunities. Alumni also share their own perceptions on a profession or career and thus can help students in selecting a career path.

These effects are most apparent in areas in which WPI is less known. Though she grew up along the upper Hudson River in New York, an area that is no stranger to quality colleges of engineering and science, Connie Keefe, '86 CE, knew little about WPI when she sent away to Worcester for a college catalog. (Her home town, Tillson, she explains, is "a 2-by-4 town—it's only on the Hess Oil maps," and is best known for the indigenous Rosendale cement that went into the foundation of the Statue of Liberty.)

The perceptions she gained and the personal treatment she received as a result of an alumnus contacting her made her think twice about WPI. "This, and a two-day stay on campus with another WPI student from New York, relieved my apprehension about the Plan."

Alumni Admissions volunteers are always welcome. If you'd like to become involved, please contact Kay Reynolds or Katie Rensky of the Admissions Office. Or if you come across a news item of a serious high-school student you think might be interested in the kind of education you received as an undergraduate, we need to hear from you.

Just think, high-school students might even call you out of the blue with questions about WPI, as one did Rene Bertrand. Imagine his delight when a squeaky-voiced ninth grader wanted to know about WPI's early admission acceptance policy. Now *that's* initiative.

Walter J. Bank, National Chairman of the Alumni Admissions Program, is Director of Marketing for DCS Corporation in Arlington, VA.

WPI CLASS NOTES

WPI Alumni Association
President, Harry W. Tenney, '56
Senior Vice President,
Donald E. Ross, '54
Vice President,
Paul W. Bayliss, '60
Secretary-Treasurer,
Stephen J. Hebert, '66
Past President, Peter H. Horstmann, '55

Executive Committee
Members-at-Large
Henry P. Allessio, '61
Walter J. Bank, '46
William J. Firla, Jr., '60
John M. McHugh, '56

Fund Board
Gerald Finkle, '57, Chair
Allen H. Levesque, '59, Vice Chair
Edwin B. Coghlin, Jr., '56
Richard A. Davis, '53
C. John Lindegren, Jr., '39
Philip H. Puddington, '59
George P. Strom, '56

1916

C. LeRoy Storms, who was employed by Western Union Telegraph Co. for 45 years prior to his retirement in 1961, has been active and has held various offices in several organizations, including the Sons of the American Revolution, the Masons and the Roselle Historical Society. He served on the Roselle Public Library Board of Directors for 20 years.

1918

Walter and Mary **Dennen** of Worcester celebrated their 60th wedding anniversary last fall at a reception given by their son and daughter. Dennen is a retired administrator of Worcester Vocational Schools. He is a member of the Rotary Club, a past president of the Tech Old-Timers Club, a retired vice president of Bay State Savings Bank and a former vice president of Higgins Armory.

Norman Knowlton writes that he recently had a cataract operation. His wife, Florence, passed away last September. He has eleven great-grandchildren.

1924

Reunion May 31–June 3, 1984

Frank Linsley, retired from Hartford Electric Light, lives at Franklin Home Healthcare in Franklin, MA. Despite problems with cataracts and arthritis, Lin writes that he is "otherwise in pretty good shape."

1927

George Heckman has taken five trips to Europe in recent years and travels annually to California to see his family. He's done 3,000 hours of volunteer work at a Virginia hospital.

Charles Moore's latest swimming record at Cleveland's Cudell Recreation Center pool is 600 miles between 1971 and 1983.

1929

Reunion May 31–June 3, 1984

The **Wayne Berrys** continue at Evergreen Woods Retirement Center in Spring Hill, FL. Wayne has served on the Resident Council and as editor of *The Evergreen Woods News.*

Nathaniel Clapp, who is now fully retired due to illness, served as a consultant to Metcalf & Eddy through 1982.

John Dobie and his wife spend winters in Arizona and summers in Massachusetts. He enjoys doing oil paintings in Arizona. In Massachusetts he keeps busy gardening and keeping up the house and grounds. He still likes taking bicycle rides.

Gale Flint writes there was "a long hot summer in Florida last year." He likes Southern winters better than Northern winters, however.

In December, the **J. Bernard Josephs** celebrated their 50th wedding anniversary at a party in Auburn, MA. Mrs. Joseph attended the University of Maryland and is retired from the library department of the Board of Education in Prince George's County, MD. Joseph, formerly an electronics engineer with the U.S. Army Materiel Command, retired after nearly 30 years with the U.S. government.

Dan Leamy has served as a Congressional delegate to the White House Conference on Aging. A resident of Camp Hill, PA, he belongs to the local YMCA Retired Men's Club and serves on the executive board of the Pennsylvania Federation of YMCA Retired Persons Clubs. He is a member of the Commissioner's Advisory Board of the County Office of Aging. A member of the Telephone Pioneers of America, he is coordinator for telephone calling for about 500 retired persons.

Since he retired in 1969, **Carl Robinson** and his wife, Irene, spend the seven winter months in Florida and the summer on Cape Cod. They both enjoy good health and drive their station wagon to and from Florida each year.

Stan Slater, who retired as vice president of Rumford Steel Industries, Providence, RI, in 1976, still actively consults "when it doesn't interfere with golf." He stays fit by walking 18 holes.

Russ Wiley writes that he's looking forward to the 55th reunion.

1930

Sherman Dane is a tax accountant in Boston.

Ray Lewis, who resides in Arlington, VA, writes that one of his most interesting activities is participating in the International Club of Washington, of which he's been a member for 14 years. "I've gathered up some 40 men, about 10 of whom appear at noon for lunch at my 'friendship' table." The group holds wide-ranging discussions concerning politics, world affairs and foreign travel. He says something is always going on in the Washington area, such as activities on the Mall, jousting tournaments, sailing, bed races and national Frisbee contests.

1931

Bob Barrett reports that he and Norinne have been retired 14 years and are enjoying condominium living in Florida. They find, as New Englanders, that colored lights on palm trees at Christmas seem somewhat strange.

Ed Bayon continues working part time with Tighe and Bond, Consulting Engineers. He and Ruth, his wife of 52 years, have nine grandchildren, the first of whom was married last June. Ed serves on the WPI Alumni Council.

Ted Coe was very excited about WPI's undefeated football season, but incensed that the team wasn't selected for the playoffs. He is looking forward to having Norwich and Middlebury on future schedules so he can establish his "tailgate parties." He and Mary Jane are both well.

Bill Dennison and his wife, Anne, moved from Orleans, MA, last year to a new home in Southborough. In June, they celebrated their 50th wedding anniversary.

Mary and **Wally Gove** recently marked their

50th wedding anniversary, also. Wally attends Tech Old-Timers meetings regularly when they are not on their frequent trips.

Ralph Hodgkinson is residing at Chapin House, a nursing home at Kendall Commons in Springfield, MA.

Carl Rylander and Mary Louise took a European trip following the 50th class reunion. In '82, they returned to Europe to visit Ireland and Scandinavia. The trip was cut short when they both became ill in Ireland. Currently, they are well.

In 1982, **Bob Taylor** and his wife, Marion, moved from Spencer to Sauquoit, NY. This involved moving about 200 cows, farm machinery and household effects, with the help of their son, Larry. They added a two-car garage, bedroom, bath and small office to their "new" four-year-old house.

The **"Red" Underhills** have returned from a trip to Australia, where they visited their two new granddaughters born "Down Under" in 1983. Red suffered a heart attack last August, and reports that his wood chopping has been restricted.

Edward J. Bayon, Class Secretary

1933

The class of '33 was well represented by ten members and two wives at the 25th anniversary meeting of the Tech Old-Timers at WPI's Gordon Library on Thursday, Dec. 10. Members came not only from the Worcester area, but also from six different towns outside. Among them were the class president, secretary, treasurer and Alumni Council representative. WPI President Ed Cranch spoke to the group about college plans for the future.

A Super Bowl XVIII party held on January 22 at the home of Barbara and **Al Brownlee** was attended by **Ed Johnson,** Gert and **Norm Clark,** Gale and **Warren Saltmarsh** and Bobbi and **George Lyman.**

Norm Clark, long an active alumni supporter of WPI, was appointed by class president **George Lyman** to serve on the Alumni Council.

Millicent Hammer, widow of our late class president, **Harold "Tack" Hammer,** is recovering satisfactorily from shoulder surgery. She was pleased to receive a visit at her home in Florida from Norm Clark, who presented her with pictures of our 50th reunion. She also appreciated receiving a copy of the reunion souvenir booklet, which contained a dedication in memory of her husband.

Ed Johnson reports that **Gil Gustafson** is in poor health and was recently admitted to the Brookview Health Care Facility in West Hartford, CT. His friends from '33 wish him a quick recovery.

Jerry Vail recently returned from a two-week trip to Yugoslavia.

Al Brownlee, Class Secretary

1934

Reunion May 31–June 3, 1984

Charles Bissell and his wife returned in February from two months at Anna Maria, FL, during which time they had several visits with **David Morely, '36.** They plan a return trip next year. Charlie retired in 1978 and spends his time gardening and sailing. During the winter, the Bissells travel.

Luther Leavitt recently received a silver good-citizenship medal, from the National Society of the Sons of the American Revolution, and the New England Society Heritage Award. The first award recognized his service to the Society at local, state and national levels, as well as to his church, his alma mater and his city. The second recognized his efforts to preserve the New England spirit in the Western Reserve. Leavitt, who received the Taylor Award in 1974, has been involved in a variety of WPI alumni activities. He resides in Cleveland.

Howard Whittum, Class Secretary

1935

Bob Branch runs a resort in Boothbay Harbor, ME, which includes a hotel, tennis courts and sailboats. Previously, he did engineering work and served in the Navy. He sees **Gordon ("Speed") Swift** occasionally in Northampton, MA, where each has a winter home.

Ed Clinton is president of the Connecticut chapter of the American Gloxinia and Gesneriad Society. He and his wife, Mary, grow prize flowers. The Clintons, who have traveled widely, saw the volcano Kilauea start to erupt on a trip to Hawaii. In 1978, Ed retired from Bassick Co., Bridgeport, CT, following 25 years of service. His final assignment was heading the task force concerned with expanding Bassick's computer capacity to include production control and costs.

For 33 years, **Sam Ehrlich** was in the explosives manufacturing business (Winchester Repeating Arms Co.) and came through without a scratch, although once a too-close lightning storm nearly did him in. While with WRA, he developed a safe, patented process for testing of the substances used in ammunition primer mixtures.

From 1961 until his retirement from government service in 1973, **Ken Linell** was chief of the Experimental Engineering Division, the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) in Hanover, NH. Earlier, he was chief of the New England Division Foundation and Materials Branch and of the Frost Effects Laboratory of the Corps of Engineers in Boston. An expert in his field, he has had books and articles published, some of which describe hazardous soil and permafrost surveys in the Arctic. He was a civilian employee of the Army for 37 years.

Cliff Martinka has built a home in Wicomico Church, VA, which looks out over Chesapeake Bay. "We have a dock right in front of the house."

Roland Nims, who is recovering from emergency surgery to correct a ruptured aortal aneurysm, says he plans to attend the 50th reunion.

In 1981, **Samson Lincoln Price,** now known as "Linc," went into semi-retirement as vice president from a firm he helped to found, Seabury-Bottorf Associates, Winter Park, FL. The company was concerned with the design of citrus concentrate plants. Previously, he had been vice president of Fiske-Gay Associates in Orlando, consulting engineers and architects. After World War II, he owned Acme Electric Heating of Boston, before returning to consulting. Other firms with which he was associated were Wheeler Reflector Company, Hanson, MA; King-Seeley, Ann Arbor, MI; and Waltham (MA) Watch Company. Although retired, Linc still consults on private water systems and wastewater disposal projects.

Charlie Puffer and his wife, Jane, are pleased that their children all live within 15 miles of their summer home in Fiskdale, MA. (They have a new grandson.) During the winter they reside in Osprey, FL. One of the big events of Charlie's life was making a hole-in-one on their Florida golf course. Before retiring, he was a valve designer for Chapman Valve Mfg. Co. Interested in clean-water standards, he writes, "We obtained one of the first EPA grants given to preserve the water quality of a lake (Big Alum, MA) rather than correct it after the fact."

Lionel Reed has been fully retired since 1966. He had dealt with real estate and securities. His chemical-engineering career ended in 1964 when he retired as assistant vice president with Schwartz Bio Research Inc.

Homer Morrison, Class Secretary

1936

Since **Perry Clark** has retired from his real-estate brokerage business in the Virgin Islands and moved to Columbia, SC, he has been involved with the Army Check Control Program. "The Army takes a dim view of bad checks," he writes. He also has been a volunteer instructor at Fort Jackson. In addition, he is a volunteer counselor for SCORE.

Earl Curtis goes to an exercise class at the Y from 6:45 a.m. to 7:15 a.m. He says he also swims and jogs a little. His second granddaughter was born last Sept. 3. His older granddaughter is now 11. In addition to being involved with the 50th Anniversary Fund, Earl has been active with church fund-raising.

Last spring, the **James Ethiers** took a trip to the Holy Land with a Methodist group. The highlight was attending a Mass at the "beautiful Church of the Annunciation in Nazareth." On the way home, they spent a few days in Holland. In October, they took a Dalmatian tour starting out in Vienna, then going through Hungary into Yugoslavia. They also went to Italy and visited Sorrento, Rome and Capri. On Oct. 4, they had a grandson, David, who has three older sisters.

The **Thomas Frarys** spend their summers in Martha's Vineyard, MA, and Peak's Island, ME. They work part time, "so we keep out of mischief."

After 36 years in West Springfield, MA, the **Brewster Howards** have sold their home and bought a condominium overlooking the ocean and tennis courts in Pompano Beach, FL. Brewster still hasn't fully retired from American Saw, to which he commutes summers from their cottage in Brookfield. He says they like tennis, swimming and warm weather.

"Ace" Howes finds that retirement is busy. He lives in Sharon, CT, in the foothills of the Berkshires, and often finds himself on the golf course. He enjoys his workshop and has "built everything from doll houses to castles and can't

keep up with the demands of my grandson and granddaughter."

The **George Sherwins** don't have time to get bored living in Naples, FL, winters. They live near two golf courses, and they play tennis, shuffleboard, bingo, and duplicate bridge; and swim and sunbathe. In the summer they head north to visit relatives.

John Wyman was co-author of "An Operational Review of Traffic Data Collection Systems," which was published in the December issue of the *ITE Journal*. He serves as director of the Maine Facility Laboratory (MFAC) of the Maine Department of Transportation. Current work includes examining weigh-in-motion techniques, bridge deflections under various wind conditions and development of automated traffic control devices.

After studying at WPI, **Theodore Wyman** worked for a steamship company on Nantucket. He took several around-the-world voyages on schooners, including one to the Galapagos Islands, where Charles Darwin had studied. In World War II, he entered the Navy and went through the campaigns of Tunisia, Anzio and Normandy. Later, he took up painting at the Vesper George School of Art. He also was associated with the studio group of a Boston artist. He worked for an engineering service in Woburn, then for the planning department at Massachusetts General Hospital. Following a heart attack, he traveled around the world. He belongs to the Sons of the American Revolution, the Steamship Historical Society and the Military Order of the World Wars.

Harold F. Henrickson, Class Secretary

1938

Last year, **Basil Kimball** went into semi-retirement, his last post having been that of chief engineer at Clark University, Worcester. He writes, "Fortunately, our children and eight grandchildren are close enough to visit frequently." The Kimballs reside in Westboro.

1939

Reunion **May 31–June 3, 1984**

1940

Clyde Gerald continues his activities with the Baltimore Society of Model Engineers and the Baltimore Streetcar Museum. Last summer he flew to Winnipeg, Canada, to attend the National Model Railroad Association convention. "My 37th," he writes. He also attended several other regional conventions, as well as the Maryland Steam Historical Society annual show. He says he had his "Toonerville Trolley" in Thanksgiving and Christmas parades.

Donald Stevens is marketing manager for the White & Bagley Co., Worcester.

1941

The **Alex Davidsons** are enjoying "relaxed" retirement in Red Bank, NJ. They travel around the country visiting their family and take trips to Europe. Davidson spends most of his time on the golf course. Two years ago he retired from Du Pont.

AWG Founder Lunches At the White House

Last September 22, 50 leaders of national women's organizations were invited to the White House for luncheon to celebrate American Business Women's Day. Vicki Cowart, '75 PH, was one of them.

"At the time, I was president of the Association for Women Geoscientists," says Cowart, who is now past president of the AWG, which she helped found in 1980. As the first nationally elected president of the association, Cowart recognized that the White House invitation was an unprecedented opportunity for AWG to interact with members of the administration, as well as with business leaders.

"One of the most exciting aspects of the event was the opportunity I had to meet other leaders from women's business and professional organizations," she says.

Cowart is a district geophysicist for the American Quasar Petroleum Company in Denver, CO. "I'm currently responsible for the geophysics of a $2.8-million wildcat oil well project, which could lead to the discovery of 20 million barrels of oil," she says. Prior to joining Quasar in 1981, she was an exploration geophysicist for Impel Energy.

Cowart, who has an MS in geophysics from Colorado School of Mines, has presented a paper, "Mossbaur Spectroscopy Investigation of Clinker Rocks," before the International Society of Exploration Geophysics. Active with NOW and as a Democratic fund-raiser, Cowart has also taught geology in local schools. In 1981, she received the AWG Denver Outstanding Leadership Award and was named an "Outstanding Young Woman of America."

President Reagan greets Vicki Cowart

1942

W. Robert Lotz, who just became a national trustee of the Amyotrophic Lateral Sclerosis Society of America, recently finished his term as chairman of the executive committee of the National Association of Congregational Christian Churches.

Robert Yaeger, former director of facilities systems at Bell Telephone Labs, Holmdel, NJ, has retired from Bell after 41 years. Currently, he is residing in Winter Harbor, ME.

1943

John Huckins is retired and residing in Chatham, MA. He had been senior project engineer for Chandler Corp./Control Systems in West Hartford, CT.

Behrends ("Pete") Messer, Jr., retired from Mobil in November following 38 years of service. His last post was manager of wholesale plant and civil engineering. Most of his career with Mobil was spent in engineering and project management activities that took him to many areas of the Far East, Middle East and Europe, as well as much of North America. Pete plans to keep himself occupied with golf, travel, woodworking and gardening.

Earl Page has been appointed chairman of the board of directors of Grinnell Fire Protection Systems Co. Inc., Providence, RI. With the firm since 1946, he had been president since 1972.

1944

Reunion **May 31–June 3, 1984**

In August, **Harold Blake** retired. He had been with the Bergen County Department of Public Works, Hackensack, NJ. He and his wife, Marge, now live in Seven Lakes, a resort-retirement community in West End "in the sand hills of central North Carolina."

Earl Harris, president of Rodney Hunt Co., Orange, MA, has been elected to the National Association of Manufacturers' board of directors. He joined the firm in 1946 and became vice president and a director in 1947. In 1952, he was named executive vice president and in 1956, president. Currently, he is a director of Blue Shield of Massachusetts and Wiegand Evaporators and serves on the executive committee of the Business Advisory Council,

School of Management for UMass, Amherst. A trustee for the Orange Savings Bank, he is also a member of the World Business Council.

1945

Bob Duffy holds a combination engineering and financial-controls post with the New Jersey Housing Finance Agency (NJHFA) in Mercerville. The agency finances senior-citizen and low-income housing. In September, Bob and his wife had a "two-week, five-island vacation in Hawaii."

Although retired, **Charles Morse, Jr.,** still does consulting work for his old firm, the World Bank. Recent stints have taken him to Kenya and Turkey. Last year he and his wife went to the Galapagos Islands.

1946

Chas. T. Main, Engineers, the Boston-based international engineering firm, has appointed **Paul Gorman** president. Prior to his appointment, Paul, currently a director of the corporation, had served as the firm's executive vice president, as group vice president in charge of engineering and design and as vice president and manager of the thermal-nuclear power division. Before joining Main in 1975, he was vice president and general manager of the Boston office of United Engineers & Constructors Inc. He has an MSME degree from Northeastern.

Art Rosenguest is president of Dustvent Inc. He is located in Arlington Heights, IL.

1948

Gershon Kulin has received a U.S. Commerce Department bronze medal for contributions to the open-channel and solid-liquid flow programs at the National Bureau of Standards (NBS). He is now a hydraulic-research engineer for the NBS Center for Chemical Engineering.

Prescott Stevens resides in Geneva, Switzerland. Two years ago he retired as a consultant to the World Health Organization.

1949

Reunion May 31–June 3, 1984

Fred Besselievre, retired from Rockwell International, now enjoys photography and identifying wildflowers. He also maintains a yard with 182 ornamental trees and more than 100 shrubs. At Rockwell, he had been a safety engineer on the space shuttle program.

Moe Nirenstein spent part of July and August working at an archeological dig at Shilo, Israel (location of the Ark of the Covenant after it was brought there by Joshua, according to the Bible). While in Israel, he visited Prof. **Smil Ruhman** at the Weizmann Institute of Science in Rehovoth. Moe writes, "Since consulting work on fossil- and nuclear-power plants is falling off drastically, I'm now with the New York City Department of Environmental Protection as a 'muddy boots' engineer."

Harvey Pastan has been elected one of three new vice presidents of Arthur D. Little Inc., the multi-national management and technology consulting firm in Cambridge, MA. Prior to his promotion, he was manager of the firm's electronics systems section. Before joining the company in 1970, he was general manager and co-founder of Setra Systems Inc., of Acton. Previously, he was vice president and general manager of the Dynisco Division of Abex Corporation.

John Wheeler has retired from Eastman Kodak as supervisor of the technical-safety research laboratory, a consulting and testing group with responsibilities for the evaluation and control of potential fire and explosion hazards of chemicals and chemical processes. He plans to move to Rochester, NH, and is looking forward to renewing ties in New England, becoming active in WPI affairs and engaging in consulting activities.

1950

Dr. **Herman Nied,** a staff mechanical engineer in the process technology branch, GE Corporate Research and Development Center, Schenectady, has been named a fellow of the American Society of Mechanical Engineers. The fellow grade is conferred upon a member who has had at least ten years' active engineering practice and who has made significant contributions to the field. Most of Dr. Nied's work has been devoted to analytical modeling and developing computer programs for nuclear-fuel elements, fracture mechanics, fluid mechanics, and thermostructural and heat transfer analyses.

A registered professional engineer, he also conducts graduate and continuing engineering courses at Union College. Currently, he is secretary of the Hudson-Mohawk Section of the ASME. He belongs to ASM, the Society of Rheology, the American Physical Society, the Society of Plastics Engineers, the American Academy of Mechanics, the American Welding Society and the Society of Experimental Stress Analysis.

James Sullivan has been appointed manager of mechanical and combustion engineering for the combustion division of Columbia Chase in Holbrook, MA. He will work primarily on the design and technology of equipment and processes being used in Columbia's coal-based liquid alternate fuel program.

Andre Tasso is director of the Communications Center for Industrial Innovation in Montreal, Canada.

1951

Richard Coffey was recently named manager of special manufacturing projects at Monsanto Co., Springfield, MA.

1953

Walter Levine wrote "Retrofitting Your Die Casting Spray Equipment for Higher Productivity with Acheson's 038 Nozzle," which appeared in the October issue of *Die Casting Engineer.* He is manager of application equipment for Acheson, which he joined in 1979. Formerly, he was engineering manager for Bindicator Co.

David Van Covern continues as president of Carolina Industrial Equipment, Charlotte, NC. Last year, his first grandchild was born.

1954

Reunion May 31–June 3, 1984

Gordon Walters, former president of Steinerfilm Inc., a technical film company, described his experiences starting a small industry in Massachusetts during the November meeting of the Northern Berkshire Industrial Management Club.

Roy Wise works as a manager at New York Telephone and lives in Englewood, NJ.

1955

Richard Quintin, materials manager for the Hamilton Standard Division, United Technologies Corp., Windsor Locks, CT, recently received his MS in management from the Hartford Graduate Center. He has his MBA from Western New England College. In 1982-83 he was one of four United Technologies employees appointed to the Corporate Fellows Program at the Hartford Graduate Center.

Art Rudman writes that he is "thoroughly enjoying the new career" as a full-time special representative with Franklin Life Insurance. Also, he continues as head football coach for Madison High School. In 1982 he was elected Maine "Coach of the Year" after leading his team to an 11-0 state championship.

The September issue of *Motor* magazine ran a profile of **Bob Stempel,** which stated that as the head of one of General Motors' five car divisions, "outsiders see [him] as having the best shot at the [GM] presidency somewhere down the road." Bob serves as vice president of GM and general manager of the Chevrolet division. He is a WPI trustee.

1957

After spending 12 years preparing tax returns, **Donald Clark** is now working toward his CPA. He is also planning to design a new house.

Leon Morgan has been appointed senior vice president of finance and accounting with United Illuminating. Since 1976 he has served as executive vice president for operations, engineering and customer services.

1958

Sanders Associates of Nashua, NH, has promoted **Stanley Graveline** to product line director for Navy programs in the electronic warfare division. He will be responsible for all of the division's Navy electronic-countermeasures

products. Prior to joining Sanders in 1967, he worked for the government at Fort Monmouth, NJ.

Raymond Johnson was recently named sales manager by Killeen Machine Tool Company Inc., Worcester. Previously, he was vice president of sales and president of the former Johnson-Claflin Corporation of Marlborough, MA, a metal-stamping firm founded in 1927 by his grandfather. In 1977, the firm merged with Nepsco Inc., of Holliston, MA, where Johnson held the post of sales manager. Currently, he is trustee of the Marlborough Public Library, president of the Friends of the Marlborough Public Library and a founding member and member of the board of directors of the Greater Marlborough Symphony Orchestra (founded in 1980).

Sherman Poultney, manager of spectrometric systems at Perkin-Elmer's electro-optical division in Danbury, CT, has been named a Perkin-Elmer senior scientist, a position recognizing the company's most outstanding technical talent. He is nationally recognized as an authority on spectrometric systems and has been central to their development at the company. Besides writing reviews for scientific publications, he has published in more than 90 other publications and has written chapters in several books. Prior to joining Perkin-Elmer in 1975, he was an associate professor at Old Dominion University in Norfolk, VA, and a research scientist at the University of Maryland. He holds a PhD from Princeton.

Robert Wolff, Jr., was recently elected vice president of Blackstone Valley Electric Co., Lincoln, RI. Previously, he was the power delivery editor with *Electrical World*, a McGraw-Hill utility industry technical publication based in New York. From 1958 to 1978 he managed several key areas in engineering, construction and system operations at Consolidated Edison Co.

1959

Reunion May 31–June 3, 1984

James Alfieri, a senior bridge engineer for the State of California, has been named senior resident engineer on the Golden Gate Bridge deck restoration in San Francisco. The two-year project, in which 9,000 feet of roadway will be replaced, will cost $52.5 million.

Capt. **Robert Allen** assumed command of the U.S. Naval Base in Guantanamo Bay during recent change-of-command ceremonies held at the base, which is located at the southern tip of Cuba. Commissioned an ensign upon graduation from WPI, during his career Allen has served as an exchange pilot in the British Royal Navy, stationed in Wales, and as a senior pilot aboard the carrier *HMS Eagle*. He also held a command post assigned to the office of the Chief of Naval Operations.

B. H. Baker is now a self-employed consultant.

Dick Bratt continues with the Materials Division at Norton Co., Worcester. Recently, he was given some selling responsibility to add to his product engineering job. He also runs Bratt Corp., a part-time business that makes warm-up baseball bats.

Wayne Gass continues at Mount Holyoke College, where he is now business manager and director of physical facilities. He has been with the college for 21 years. His wife, Marilyn, teaches.

Dave Miller is currently with OHMIC Filters in St. Michaels, MD.

Joel Nelson of Augusta, GA, works in a state mental hospital, rehabilitating alcoholics and drug addicts.

"Skip" Nitchie left IBM after nearly 19 years to work for Storage Technology Corporation, where he serves as director of corporate quality. Currently, he is working to develop the first commercial laser optical storage drive, 4 gigabytes of storage per disk. He also heads Nitchie Associates, Boulder, CO, which produces a device to control warp of corrugated paperboard during its manufacture.

William Pursell, Jr., is vice president of manufacturing at Camco Inc., which manufactures subsurface-production and safety equipment for oil and gas wells.

Dick Ronskavitz of Fort Lauderdale, FL, says that he and his family are looking forward to attending the 25th reunion. Currently, he is the assistant director of the Broward County Traffic Engineering Division. "For the past two years we have been working a 4-day schedule, with plenty of time for golf, fishing and boating," he writes.

Gordon Sigman is vice president of Command and Control systems at Norden Systems, Norwalk, CT, a division of UTC.

Stanley Sokoloff is a partner in a 12-man law firm in Beverly Hills, CA. The firm, Blakely, Sokoloff, Taylor and Zafman, specializes in intellectual-property law. The Sokoloffs, who have three children, recently celebrated their 21st wedding anniversary.

Edwin Tenney serves as manager of mechanical collectors for GE Environmental Services Inc., Lebanon, PA. He writes, "This job has taken me to oil refineries around the world." His son, **Douglas**, is a sophomore at WPI.

Recently, **Stan Wallner** was promoted to manager of the Orlando, FL, branch of Fisher Scientific Co. He had been manager of the Detroit branch since 1977. With the exception of a two-year Army stint, Stan has been with Fisher since 1962. He has an MBA in marketing from Seton Hall University. The Wallners have a five-year-old son and twin daughters, age 3.

With Harris Government Satellite Comm. Division for 14 years, **William Whitehead** enjoys running, emergency medicine and community theater.

Jack Wolfe is now senior vice president of Western Hemisphere Operations for EG&G Sealol in Providence, RI. Previously, he was senior vice president of North American Operations for the firm. For the past seven years (three as president), he has served on the board of directors of the Northeast Labor-Management Center, a nonprofit organization providing quality of work life consulting services to industry and the public.

Edward Wysocki writes, "Enjoying life on my 76-acre airport located in my backyard." Besides working as a project engineer for Pratt & Whitney Aircraft, he operates the Wysocki Field in Ellington, CT, and is chairman of the board of Northeast Airfoto Service. Son **Ed, Jr., '81**, is a project engineer at Hamilton Standard and owns and operates a helicopter service. Son **Joseph, '83**, helps with the family business and works as a mechanical-design engineer at UTC Research Center. Edward's son James owns and operates the Connecticut Flight Center and his daughter, Dianne, recently held an internship with James River Graphics. His wife, Alice, is president of his company.

Fred Lutze, Class Secretary

1960

Dr. **Robert Condrate**, professor of spectroscopy at the New York State College of Ceramics at Alfred University, has been elected to membership in Britain's Royal Society of Chemistry. His election was part of a reciprocal membership agreement between the British group and the AIC. Condrate is a fellow of the latter organization. He has an international reputation as a researcher in the optical properties of matter. A prolific author, he has written technical papers for more than a dozen professional publications.

1962

MARRIED: Richard DiBuono and Diana Dorsey of Sacramento, CA, on January 14, 1984. Dick has resigned from the Corps of Engineers and has founded his own company, DiBuono Distributing Co. Inc., in California. The firm is primarily concerned with the sales and distribution of an automobile anti-theft ignition lock called Sav-Car. It is manufactured by Safety Controls Inc., of Worcester.

Andrew Terwilleger writes that his Kiwanis activity keeps him busy. Recently, following a year in office, he received the Distinguished Lieutenant Governor award. Now he is serving as chairman of support for spiritual aims in the Kentucky-Tennessee District.

1963

Kenneth Backer has been named vice president of marketing at Verbex, a division of Exxon Enterprises in Bedford, MA. He is responsible for the sales and marketing of the firm's new family of Model 3000 voice data entry terminals. Most recently, he was manager of Northeast branch operations for Raytheon Data Systems.

Having recently returned from England to Massachusetts, **Roger Flood** is now vice president of engineering at Badger Engineers Inc., Cambridge. He had been vice president and general manager of the London office.

Harry Hoyen and his family toured seven European countries last summer. In July, he delivered an invited paper at the Institute of Theoretical Physics in Trieste, Italy.

Dr. **Richard Kashnow** has been named general manager of GE's quartz and chemical products department. He joined GE in 1970, and he was named manager of the aerospace business group's electronics lab in 1979 and product general manager of the lighting business group's Halarc product section in 1981. He holds three patents and has written 30 technical papers.

John Machonis, Jr., was recently presented

with a 15-year service award by Chemplex Co., Rolling Meadows, IL. He is manager of research and development for the firm.

Harold Wright has assumed the post of sales manager at Vee-Arc Corp., Westboro, MA. He is responsible for company sales in the U.S. and Canada. Prior to joining Vee-Arc, he was with WER Industrial and R.T. Engineering.

1964

Reunion May 31–June 3, 1984

Dr. **Chao Chi** is now group manager at MPI/CDC in Santa Clara, CA.

Alpha Industries of Woburn, MA, recently appointed Dr. **Steven Mittleman** as principal engineer. His responsibilities will include developing high-frequency GaAs FET devices and voltage controlled oscillator circuits. Previously, he was a technical staff member at Sperry Research Center. He has a PhD and an ScM in electrical sciences, solid state, from Brown. Currently, he is academic coordinator of microelectronics for the state-of-the-art engineering program at Northeastern.

Gerald Tammi serves as technical assistant to the senior vice president at Data General, Westboro, MA.

1965

John Iannotti has been promoted to area operating manager in the Wilkes-Barre area of the Pennsylvania Power & Light Company's central division. In his new post, he will manage engineering, construction and associated support activities for the Wilkes-Barre area. He started his career as an industrial sales engineer in the Scranton marketing department. He was named senior engineer of distribution methods and tools in 1973 and acting production manager for distribution between 1980 and 1982.

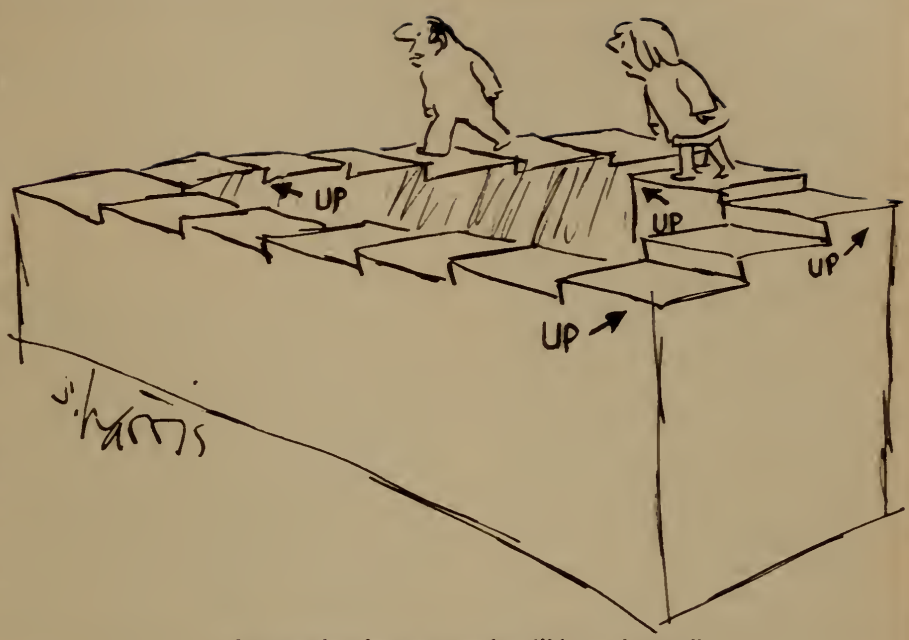
Phillip Martin, who has worked in system protection at Public Service of New Hampshire since 1965, wrote "Adequate Protection Means Greater Reliability," which appeared in the December issue of *Transmission and Distribution.* He received his MSEM from Northeastern University in 1972.

1966

BORN: to Mr. and Mrs. **Anthony Sacovitch** their fifth daughter, Kristina, recently. Tony is plant manager at Wright Machine Corp., Worcester.

Richard Nelson placed 11th out of about 70 cars in the recent Great American Car Race, a time-speed-distance rally for pre-1942 cars. The course went from Anaheim, CA, to Indianapolis (2,800 miles) and took seven days to complete. Dick is an oil and gas producer with Nelson Oil and Gas. He is located in Shreveport, LA.

John Wright was recently named director of marketing and sales for cheese products by Stauffer Chemical Co. In this newly created post, he directs an expanded marketing, sales and technical support program serving cheese manufacturing industries. After holding industrial and food chemical sales and marketing posts with Stauffer, he was marketing manager for food phosphates for the food ingredients division prior to his promotion.



"Just another few steps and we'll be at the top."

Joseph Wright has been elected vice president of technical marketing at Jamesbury Corp., Worcester. With the firm since 1967, he had been chief engineer for ball valves, wafersphere valves and butterfly valves.

1967

MARRIED: Edward Ciarpella to Jean Souza on August 7, 1983. She is head of the business department at Tiverton (RI) High School, where he teaches secondary mathematics. Currently, Ciarpella is vice president of the National Education Association in Tiverton and a member of the executive committee of the NEA in Rhode Island.

Roger Bartholomew gave a talk on cave exploration (spelunking) at a recent meeting of the Rome (NY) Academy of Sciences. An accomplished cave photographer, he is a member of the National Speleological Society. He has taught high-school and college physics and has explored, mapped or photographed caves from Texas to New York, as well as caves in British Columbia.

Dr. **Roger Gariepy** was recently appointed manager of Air Products' process systems group, management information services (MIS). He joined Air Products in 1972 as a scientific systems analyst in the management information division. Prior to his most recent appointment, he was manager of engineering systems in MIS.

John Hitchcock has been appointed vice president of Cicirello Construction Company, Kirtland, OH. He and his wife, Marilyn, have two sons: Bill, 8, and Andy, 4.

In December, **Jack Rahaim,** corporate manager in personnel administration for Digital Equipment Corporation, led a seminar on "Developing an Automated Personnel System" at Mount Wachusett Community College in Gardner, MA. An experienced seminar leader, he holds an MBA from the University of New Haven. Prior to joining DEC, he worked in the building automation field. He is on the adjunct faculties of WPI and Mount Wachusett Community College. His article, "Who's in Control Here," appeared in the January issue of *Computerworld.*

1968

MARRIED: William Nordstrom to Paula Swenson in Leverett, MA, on January 14, 1984. Paula, a therapist for the Franklin County Mental Health Association, has a master's degree from UMass. Bill is technical manager of pumps for the Kontro Co. in Orange, MA.

Dr. **Roger Pryor,** a technical advisor in corporate scientific research, is one of five employees appointed a senior member of the technical staff at Pitney Bowes. He joined the company in 1976 as a senior physicist and project manager and has also served as a manager of physical sciences. Formerly he was affiliated with Bell Telephone Labs, Whippany, NJ. He holds a doctorate and a master's degree in physics from Pennsylvania State University. He is a visiting professor of physics in the graduate school at the University of Connecticut, a senior member of the IEEE and chairman of several professional committees.

1969

Reunion **September 22, 1984**

MARRIED: Alexander Malcolm and Jane Lindsay in Coventry, RI, on October 8, 1983. Jane graduated from the Newport Hospital School of Nursing.

Charles Forand has been named a district manager in Information Systems Organization (ISO) services for New England Telephone in Boston. In his new post, he works with testing apparatus used by computer programmers, introduction of new software products and support of data centers. He joined the firm in 1972 and has worked for the Framingham long-distance switching center and Bell Labs in NJ.

Andy Perreault, who has been a nuclear engineer at GE's Knolls Atomic Laboratory, Schenectady, NY, for 12 years, was recently the senior physicist for the reactor start-up team for the *The USS Salt Lake City*, one of the Navy's most advanced nuclear powered attack submarines. The Perreaults have two children and enjoy cross-country skiing, bridge and music. "We all play the piano."

Stephen Spakowsky, product development engineer for Eastman Kodak Co., recently received an Emmy award from the National Academy of Television Arts and Sciences for his contributions to the development of Eastman color high-speed negative film 5293.

A.B. Chance Company has named **Ron Stelmak** international marketing director. He transferred to Centralia, MO, after having served as an account representative in the New York area. Before joining Chance in 1972, he was with Westinghouse.

Peter Walsh is with Engineering Directions, Melville, NY.

William Willand is assistant chief engineer for Arute Brothers Inc., New Britain, CT.

1970

Alan Breitman has been named an associate in the Boston office of William M. Mercer Inc., the employee benefits and compensation consulting firm. He joined the firm in 1979 as a consulting actuary after four years as an assistant actuary with Boston Mutual Life Insurance Co. Previously he was an actuarial assistant with State Mutual.

John Demase was recently promoted to senior customer support representative at Pratt & Whitney's government products division, West Palm Beach, FL. He deals with P&W's foreign customers on post-production activities. He holds an MSME from RPI.

William Hillner, who is located in Kingwood, TX, continues as operations superintendent at Exxon. He has three daughters.

Dr. **Jerry Johnson** has been named a recipient of Cyanamid's prestigious 1983 Scientific Achievement Award. At recent award ceremonies in New York City, he was one of 15 employees from the firm's research facilities around the world honored by the company president. A research chemist with Cyanamid's agricultural research division in Princeton, NJ, Johnson was cited for his discovery of a new herbicide being developed for weed control in soybeans.

Edward Mason now holds the post of director of Cummins Diesel International in Brazil. He and his wife, Norma, have two children.

He Plumbs the Mysteries Of the Human Brain

Having trouble getting a good night's sleep? If the answer is yes, Dr. Joseph Bronzino, '59 EE, may soon have the solution to your problem.

Bronzino, who is chairman of the Department of Engineering at Trinity College, Hartford, CT, is principal investigator for a National Science Foundation-funded project titled "Neuronal Mechanisms Involved in Sleep-Waking Oscillation."

In applying engineering techniques to medical study, Bronzino has also contributed greatly to investigations on the effects of protein malnutrition in the developing brain and to studies of pain modification through neural manipulation.

Although his specialty is research, Bronzino enjoys teaching. Foreseeing that many industries will be revolutionized by the computer within the next decade, he says that a liberal arts education, such as Trinity offers, must be well tempered with science and technology.

"We have already crossed the threshold into a new technological era," he says. "With computers we can manipulate and analyze information much faster than the human brain. Computers offer the potential to be extensions of the human brain, just as the automobile is an aid in locomotion and sensory aids assist in perception."

Dr. Joseph Bronzino

Since 1977, Bronzino has been the Vernon Roosa Professor of Applied Science, an endowed chair at Trinity. He is also chairman of the biomedical engineering program at Hartford Graduate Center and an active participant in brain research studies at the Worcester Foundation for Experimental Biology.

Bronzino has an MSEE from the U.S. Naval Postgraduate School and a PhD from WPI. His second book, *Computer Applications for Patient Care* (Addison Wesley), was published in 1982.

1971

Leonard Andreozzi is a senior member of the technical staff at Ball Aerospace Systems Division in Boulder, CO.

Benjamin Katcoff, corporate benefits manager for Polaroid, has been selected as a Pew Health Policy Fellow for 1983-85. The fellows program is sponsored jointly by Boston University's Center for Industry and Health Care and Brandeis University's Heller Graduate School and provides advanced training in health policy to individuals from both the corporate and public sectors. Katcoff is a member of the Health Care Task Force of the Massachusetts Business Round Table and a member of the Policy Development Committee of the Greater Boston Health Planning Council.

Currently, **Jeffrey Lassey** is supervisor of plant engineering at the Wyman Gordon plant in Grafton, MA, where he had been facilities engineer. Jeffrey and his wife, Lynne, have two children, Stephanie, 5, and Jeffrey, 2.

John Petrillo is now vice president of sales for AT&T Communications in Los Angeles. He is in charge of national accounts on the West Coast. The Petrillos have two sons, Michael, 5, and Matthew, 2.

Dan Smith has been appointed manager of Morgan Isley Systems in the furnace equipment department of Morgan Construction Company. He is responsible for Morgan secondary regenerator systems, reversing valves and ejector stacks. With the department since 1979, he had been a sales engineer at Rodney Hunt Company in the industrial roll division and at Riley Stoker, where he helped design fuel burning equipment for fossil fuel utility boilers.

1972

Dr. **Raymond Fish,** a regional trauma center physician at Burnham Hospital, Champaign, IL, has been certified as a diplomate of the American Board of Emergency Medicine. He holds a medical degree from the Pritzner School of Medicine at the University of Chicago and a PhD in biomedical engineering from WPI and Clark University.

Adrien Gaudreau is chief of the Configuration Management Branch for the USAF at Camp Smith, HI.

Jim Hall was recently named regional marketing director in Europe for Norton Company's new organization, established to meet Construction Products' worldwide marketing program. His responsibilities include the United Kingdom, Benelux, Scandinavia, the

Middle East and Africa, in addition to giving guidance to marketing operations in Spain. Prior to his appointment, Jim had been in Gainesville, GA, where he had served as marketing director in North America for Norton. Jim, his wife, Renee, and daughters Leslie, 5, and Ashley, 2, reside in Luxembourg.

Stephen Wilkinson is packaging manager for Astra Pharmaceutical Products, Westboro, MA.

1973

Stephen Johnson has joined the seacoast division of Public Service of New Hampshire (PSNH) as division electrical engineer. He joined PSNH in 1973 as a cadet engineer in the distribution department.

Peter Martin is a senior engineer for Mobil Oil Corp. in Pennington, NJ.

Robert Starnes is the group leader for biochemistry at Novo Laboratories in Wilton, CT. He has a PhD from the University of Pennsylvania.

Tim Whitehouse serves as a sales production engineer for American Concrete Pipe in Milwaukee, WI.

Francis Yanuskiewicz was recently appointed an associate by the consulting engineering firm of Weston & Sampson Engineers Inc., Wakefield, MA. He holds the Value Engineering Certificate from the EPA and the Society of American Value Engineers, and he belongs to the New England Water Pollution Control Association. A registered professional engineer in Maine and Massachusetts, he has been involved in a number of wastewater and drainage designs, including work for the MDC in Boston.

1974

Reunion **September 22, 1984**

MARRIED: James Sgroi to Cheri Roberge in York Harbor, ME. Cheri, a sales coordinator in customer relations for Prime Computer, Natick, MA, graduated from Keene (NH) State College. Jim is with Patti Brothers Inc., Sudbury, MA.

William Byron, director of clinical operations for Eastern Maine Medical Center, has been accepted as a member of the American College of Hospital Administrators. He joined the center in 1978 and has an MBA from Boston University.

Michael Martowska holds a new post as senior packaging development engineer with Purdue Frederick Company in Norwalk, CT.

Jerry Masi is president of Eric Bruckner & Company, a real-estate investment firm in Santa Barbara, CA. He enjoys camping, travel, boating, fishing and skiing. He says that his family is a speedboat, a lovebird named Chico and a swordfish named Cutup.

Will McBride is now an electrical-project engineer for Price/Ciri in Anchorage, AK. He recently set up an electrical-construction department for a $60-million job at the North Slope (Prudhoe Bay, AK) for SOHIO. He manages estimators, material coordinators, field engineers, drafters, document control and quality control. Previously with ARCO, he is a registered professional engineer in Alaska and consults under the name of Northern Energy R&D.

Russell Naber, who received his MBA in marketing from Xavier University last year, has been promoted to section head in food product development at Procter & Gamble, with responsibility for Duncan Hines products.

Tony Tomasiello, an attorney associated with the law firm of Healy & Rocheleau, P.C., Worcester, currently resides in Holden, MA. His wife, Janet, a self-employed graphic designer, received a BA and a BFA from Emmanuel College.

Jim Rubino, Class Secretary

1975

MARRIED: Wayne DuPont and Gail Fyrberg in Southborough, MA, on October 15, 1983. She graduated from Algonquin Regional High School and is a production control planner at Prime Computer in Framingham. He is an engineering manager at Digital Equipment Corp., Acton, MA. . . . **Edward Karedes** to Sheila Roake recently in South Boston, MA. She attended UMass in Boston and currently attends Southern Connecticut State College. He works for Sikorsky Aircraft, Stratford, CT. . . . **Gregory Miranda** and Kim Houde on July 23, 1983, in South Hadley, MA. Kim graduated from Mount Holyoke and holds a master's degree from Yale. She is a clinical research assistant in the department of anesthesia at UMass Medical School. Gregory is a chemist for Biomeasure Inc., Hopkinton, MA.

BORN: to Alice and **Ed Griffin** a daughter, Sheena, on December 30, 1983.

Fred Greulich is manager of production for Frito Lay in Binghamton, NY.

Robert Miller of Shrewsbury, MA, is now the owner-manager of a ComputerLand store. He received his MBA from RPI. Formerly, he was a senior quality engineer for DEC.

Capt. **Doug Sargent** has been assigned as chief of programs and engineering at Thule Air Base in Greenland. He is evaluating contractor performance on an $80-million operations and maintenance contract, as well as reviewing plans and coordinating construction of several projects to be built in the harsh arctic environment.

1976

MARRIED: Richard Dew III to Linda Rader in Framingham, MA, on September 10, 1983. Linda attended Virginia Intermont College and is employed as a cancer registrar at Milton Hospital. Richard, who attended both WPI and Mass. College of Pharmacy, is a dispatcher for Boston Cab Co. . . . **Peter Golrick** and Jeanne Surette recently in Clinton, MA. She graduated from Northeastern, has a master's degree from Lesley College and is a special-needs teacher at Shrewsbury High School. Peter is a supervisor in data processing for Coca-Cola in Needham. . . . **Gregory Kedderis** to Lorrene Buckley in New Fairfield, CT, on November 26, 1983. Lorrene graduated from the State University College at Geneseo, NY, and from the University of Arizona at Tucson. Gregory has a PhD in biochemistry from Northwestern University Medical School in Chicago. She is a senior research associate and he is a postdoctoral fellow at the Chemical Industry Institute of Toxicology, Research Triangle Park, NC. . . . **Eduardas Meilus, Jr.,** and Terese Gaidelis in Chicago on September 24, 1983. A graphic artist and photographer, Terese graduated from the College of Saint Mary in Omaha. He holds an MBA from WPI and is a quality control engineer for Raytheon in Northboro, MA. . . . **Thomas Vaughn** and Cynthia Almond in Ridgefield, CT, on June 18, 1983. She graduated from Northeastern and was a CPA with Chas. T. Main and with Deloitte Haskins and Sells, both in Boston. He is a sales engineer with Albany International.

James Buss has been promoted to director of individual-product development at State Mutual in Worcester. In 1982 he earned the designation of fellow of the Society of Actuaries.

Al Cooley continues with the Codex subsidiary of Motorola in Canton, MA, where he was recently promoted to manager of product marketing. He is responsible for identifying and implementing products and programs that will increase Codex's share in the low end of the data transmission market. He writes, "I'm also about halfway through a master's degree in computer engineering at Boston University."

"B. J." Johnson, a group underwriting consultant for northeastern group operations of Prudential Insurance Co., Parsippany, NJ, currently resides in Morris Plains.

Donald Mick was recently appointed director of software systems engineering at Sanders Associates in Nashua, NH. With the firm since 1967, he has held several managerial positions. He has a BSEE from the University of Michigan, a master's degree in computer science from WPI, an MBA from Rivier College and a law degree from the University of Santa Clara.

Nancy Sauberman, a student at St. George's University Medical School in Grenada, was safely escorted from the island during the evacuation last fall.

1977

MARRIED: Andrew Clancy to Marianne Sergott recently in Chestnut Hill, MA. Marianne graduated from the University of Pennsylvania School of Dental Hygiene and holds a degree from the University of Pittsburgh School of Allied Health Professions. Andrew is employed by Western Electric Marketing Organization. . . . **George Robinson** and Harriet Lewis in North Auburn, ME, on September 3, 1983. A member of the Maine legislature, she graduated from Wellesley and has her PhD in Greek archaeology from the University of Minnesota. George is president of Robinson Manufacturing Company in Oxford.

Richard Garstka has been promoted to senior systems consultant within the systems organization at State Mutual Life Assurance Company. He joined the firm as a senior systems analyst in 1980.

Jeff Tingle continues as a graduate student in the department of geological sciences at Brown University in Providence, RI.

Last September, **Robert Ware** received his ScD in chemical engineering from MIT. Currently, he is with Mobil Research & Development Corporation in Paulsboro, NJ.

1978

MARRIED: Paul Angelico to Donna LaCroix on September 24, 1983, in Worcester. She graduated from Wheaton College, Norton, MA, and is in the personnel administration department of Computervision Corp. in Bedford. Paul is engineering manager of Procter & Gamble in Quincy, MA. . . . **Dean Arvidson, Jr.,** and **Cathleen Linehan, '80,** on October 15, 1983, in Milton, MA. Cathleen is with DEC and Dean with Norton Co. He has his MBA from Boston College School of Management. . . . **Andrew Corman** to Judith Pack on November 26, 1983, in Wheeling, WV. Judith, who is a personal-line analyst with Aetna Life and Casualty Co., graduated from Marshall University. Andrew works for Turner Construction Co., Columbus, OH. . . . **Mark Freitas** to Anne Marie Nadeau on October 22, 1983, in Norton, MA. She graduated from Potsdam State College. Both she and Mark are employed by Codex Corporation, Mansfield, MA.

MARRIED: Martin Grossman and Doreen Greenstein on October 30, 1983, in Andover, MA. Doreen graduated from Quinnipiac College and is a clinical leader of occupational therapy at Lenox Hill Nursing and Rehab Care Facility in Lynn. Martin is a computer software engineer at Raytheon in Bedford. . . . **Charles Marden, Jr.,** and Annette Monty on October 15, 1983, in Barre, VT. Annette graduated from Mary Hitchcock Memorial Hospital School of Nursing in Hanover, NH, and is with the Tufts New England Medical Center in Boston. Charles is a lieutenant in the U.S. Navy. . . . **Brian McLane** and Kathleen Walsh on September 24, 1983, in Malden, MA. A customer service secretary for Mohawk Data Sciences in Woburn, she graduated from Malden High School. He is an analog design engineer at Lexidata Corp., Billerica. . . . **Louis Pelletier, Jr.,** and Paula Aubuchon in Fitchburg, MA. Paula holds a BS in education from Fitchburg State College and is employed in personnel at Digital Equipment Corp., Westminster. Louis is vice president of V. Pelletier & Sons, Fitchburg.

BORN: to **Pierre Fleurant** and **Cathy Kerley Fleurant, '79,** their first child, William Joseph, on September 9, 1983. In October, Pierre started a new job as senior design engineer for Clinical Data Inc., Boston. The company designs, manufactures and markets medical electronic products and provides computer-assisted services to the cardiovascular and pediatric markets.

Andrea Curtis serves as product marketing manager at Data General Corp., Westboro, MA. Last year, she received her MBA from Boston College.

Elizabeth Donahue holds the post of director of drug and alcohol services for Health Industries of America, North Augusta, SC.

Theodore Erickson is superintendent of Gilbert & Bennett Mfg. Co., located in Georgetown, CT.

John Moulton serves as a senior manufacturing engineer at Robert Bosch Corp., Charleston Heights, SC. Recently he was on temporary assignment in West Germany.

Louis Piazza teaches in Milford, MA.

Sandra Hoyle Renda is a senior engineer for DEC in Littleton, MA.

1979

Reunion **September 22, 1984**

MARRIED: Stephen Kapurch to Kim MacDonald in Hamilton, Ontario, Canada, on September 10, 1983. Kim graduated from G.E. Perdue School in Oakville, Canada, and was a secretary for the Canadian Armed Forces at Lockheed in Burbank, CA. Stephen is project manager at the Pacific Missile Test Center in Point Mugu. . . . **Michael Poirier** and **Laura**

Mattick, '78, on October 8, 1983, in Newark, DE. . . . **Robert Schifiliti** to Christine Wenninger on November 5, 1983, in Pittsburgh. She holds nursing degrees from Syracuse University and Boston University and is a clinical nurse specialist for Baystate Medical Center, Springfield, MA. A systems consultant for Massachusetts Fire Alarms of New England in Lowell, MA, Schifiliti is also a candidate for a master's degree in fire protection engineering at WPI.

C. Steve Anderson has been appointed chief engineer of ball valves at Jamesbury Corp., Worcester. For the past ten years, he has been involved in ball valve research, design and development at Jamesbury.

Dr. **James Armitage** holds the post of senior engineer for GTE's strategic systems division in Westboro, MA.

Gerard DeRome is section manager at Burroughs Corp., Danbury, CT.

John Gordeuk, who is with Link Electronics, Houston, TX, is a physicist for the space shuttle mission simulation.

Kathleen Lies Hallren is currently an associate attorney with Hieronymus Hodgden & Meyer, Woodward, OK. She received her JD degree from the University of Oklahoma in 1982.

Dorothy Hamilton is a lecturer in chemistry at Smith College, Northampton, MA.

Larry Marino has been promoted to district staff manager for support of general business market sales operations for the Northeast region of AT&T Communications. He is located in Manhattan.

James Sloss works as project manager at International Technologies, Martinez, CA.

Jeffrey Stickles continues as operations manager at Visual Technology in Lowell, MA.

David West is a supervisor of track for NJ Transit Rail Operations Inc., Hoboken.

Karen Wright serves as a senior software engineer at System Analysis Corp., Wellesley, MA.

1980

MARRIED: Joseph Mayall and Catherine Kavanaugh in South Dartmouth, MA. A registered nurse at Beth Israel Hospital, Boston, Catherine graduated from Boston College. Joseph is with Babcock and Wilcox Engineering Co. . . . **Thomas McBride** and Lynda Shea recently in Shrewsbury, MA. She graduated from Becker and is a manager of Weathervane in Auburn Mall. He works for Stone & Webster in Boston. . . . **Stephen Rehn** to Joy Beauvillier on October 15, 1983, in Watertown, CT. Joy graduated from UConn and attended Radcliffe Graduate Seminars. She is a shortage analyst for Filene's in Boston. Stephen is a products manager for Panametrics, Waltham, MA. He also is a lecturer for Northeastern University's state-of-the-art engineering program.

MARRIED: Richard Stephens and Deborah Peters in Excelsior, PA, on September 3, 1983. Deborah holds a BS in clothing textiles and design from the University of Wisconsin. . . . **Charles Sullivan III** and Colleen Bohan in New York City in December. Colleen, a graduate of Regis College, Weston, MA, works for Mutual Benefit Financial Services in Providence, RI. Charles is with Fleet Financial Group's corporate training program, also in Providence.

BORN: to John and Judy Gemma-**Sjostedt** their second child, Jennifer Marie, on October 10, 1983. Brother Peter is now nearly 2. Jennifer's grandfather is **Rowland Gemma, '79 SIM,** chief estimator at Morgan Construction Co. Her aunt is **Jackie Gemma, '83,** a CADS/CAM engineer for General Dynamics. Her father, John, is still employed with Du Pont and was recently promoted to laboratory supervisor of the Washington Works Research Facilities, Parkersburg, WV.

Jay Bellingham is a results engineer for Potomac Electric Power Co., Washington, DC.

Currently, **Richard** and **Kathy Grider Coleman** are residing in California, where he is with the Janus Combat Simulation Project in Livermore. Recently, he helped in a project presentation to the Joint Chiefs of Staff. Previously he was with the administrative data processing group at Lawrence Livermore Labs. Kathy, who had been with GE Nuclear, is now working for Applied Information Memories in Milpitas, CA. She is involved with the next generation of computer disks and drives.

Tom Daniels holds the post of assistant engineer at Duke Power Company, Charlotte, NC. He is working in the probabilistic risk assessment unit, reactor safety group, nuclear engineering services.

Timothy D'Arcy holds the post of territory manager for Parker Hannifin in Cleveland, OH.

Margaret Davis is chairman of the mathematics department at Concord/Carlisle Regional High School in Concord, MA.

Allan Fish is New England district manager for Balston Inc., Lexington, MA.

Cathryn Ricci Giunta has been promoted to senior packaging engineer at Digital Equipment Corporation, Hudson, MA.

Carl Hammer writes: "My work at the church is shaping up a bit. Am learning to cut corners to make my work more productive."

Richard Hennessy is a quality engineer at Brown & Sharpe Mfg. Co., North Kingstown, RI.

David Hoercher, who has his MS in electric power engineering from RPI, is with the Standard Oil Co., Cleveland, OH.

Brian Huntley spoke on energy issues before the North Smithfield (RI) Kiwanis Club in November. He is associate planning engineer with Eastern Utilities Association (EUA) Service Corporation, the parent company of Blackstone Valley Electric Co. He joined the firm in 1982.

William Jones is a teacher and chairman of the mathematics department at Springfield (MA) Technical High School.

Lisa Krauss, a WPI class agent, writes that she is still working as a staff engineer in product development for Procter & Gamble. She enjoys swimming, weight lifting, softball and "good times in general in Cincinnati."

Michael J. Lombardi has begun his first year of study in the evening division at New England School of Law in Boston. He is certified in nuclear-power plant design by Bechtel Power Corporation.

Robert Mochi works for Black & Veaton Engineers/Architects in Bethesda, MD.

Patricia Monterio, a market analyst for Fluor Corporation, Irvine, CA, is also studying for her MBA at Pepperdine.

John Moriarty and two other Du Pont employees recently finished in sixth place in the Budweiser Light U.S. Triathlon Series in Austin, TX. He competed in the 15-kilometer run. John is employed at Du Pont's chemicals and pigments plant outside of Houston, TX.

Tom Nowak is currently a major with the U.S. Army in Europe.

Alfred Poon is a software engineer at Digital Equipment Corp., Maynard, MA.

Thomas Snead is an assistant chemist at Ciba Geigy Corp., Ardsley, NY.

Paula Mesite Szkutak is employed as a senior engineer at GTE in Research Triangle Park, NC.

1981

MARRIED: Patricia Ficociello and Stephen Gorgol in East Brookfield, MA, on October 15, 1983. Patricia is with Corning Medical in East Walpole, MA. Gorgol graduated from Plymouth (NH) State College and is employed by Memtech Corp., Salem, NH. . . . **Robert Gardella, Jr.,** and Sandra Hammond in Worcester on September 3, 1983. Previously a student at Worcester State College, Sandra is currently studying at the University of Southern Maine in Gorham. Bob is an actuary at Union Mutual, Portland. . . . **Elizabeth Morrison** and David Allard in Moosup, CT, on December 30, 1983. She is with Electric Boat. He attended Plainfield schools and is a self-employed carpenter.

MARRIED: William Morse and Anne Marie Furey in Vernon, CT, on October 15, 1983. She graduated from the University of Hartford and he serves as a civil engineer for Ebasco. . . . **Brian Stoffers** and Cathy Martell in North Billerica, MA, on October 8, 1983. Cathy graduated from Burdett Business School and is with Computervision, Burlington, MA. Brian, who has both a BSEE and an MSEE from WPI, works for Honeywell in Billerica. . . . **Stephen Zalewski** and Kathleen Brennan in Holyoke, MA, on November 19, 1983. She graduated from George Washington University Law School and is a contract administrator for Bolt Beranek and Newman Inc., Cambridge, MA. He serves as a software engineer for DEC in Nashua, NH.

George Awiszus is a design engineer with GE in Fitchburg, MA. He is also studying for his MS at WPI.

Arthur Beaubien continues as an electronics design engineer at Frequency & Time Systems in Beverly, MA.

Cynthia Canistro is a material controller at Sanders in Nashua, NH.

John Coffey works as a design engineer for Data Precision/Analogic in Danvers, MA.

David Jacobs is a radiological physicist for the Air Force Weapons Laboratory, Kirtland AFB, NM.

Clifton Jones works for Whitman and Howard Inc., Wellesley, MA.

1st Lt. **Mark Malenbaum** is with the U.S. Air Force space division in El Segundo, CA.

Lory Molesky serves as a systems programmer for New York State in Stony Brook.

Eduardo Navarro is an MBA student at Amos Tuck School of Business, Dartmouth College.

John Payne is employed as a systems engineer at Automatix in Billerica, MA.

Stanley Siver is now a Naval officer in Na-

Molinari with products in hand

His Data Translation Keeps on Growing

Ten years ago Data Translation Inc. was a shaky, start-up company located above a deli in downtown Framingham, MA. Today it's situated in a 30,000-square-foot building in Marlboro, employs 125 and holds the largest share of the market for a specialized computer board peripheral.

"For three years in a row we've made *Inc.* magazine's list of the 500 fastest-growing privately held companies in America," reports Fred Molinari, '63 EE, president and a founder of the company. "This puts us in kind of a special place," he adds. "But as you get a little bigger, it's harder to keep up the pace."

Data Translation manufactures a peripheral device that allows computers to understand signals from sensors, such as thermocouples, pressure transducers and accelerometers. One of the benefits of the device is that it gives computers the facility to measure and control machines managing in industrial environments.

The firm has shown extraordinary growth. Sales were $1.4 million in 1978, $8.1 million in 1982 and $10.5 million in 1983. Advances in computer technology coupled with customer demand for more sophisticated use of their machines have spurred sales.

Fred, formerly a vice president and marketing manager at Analog Devices, says of success in general, "You have to have a product that has a growing market. You have to find something that you enjoy doing, as well."

And, he contends, "You can never know or study enough. I'd like to be going to school now. There's so much to learn." He holds an MSEE from Northeastern and an MBA from Harvard.

In his spare time, Fred enjoys tennis, golf, squash and skiing. He and his wife, Maureen, have four children: John, a senior at Middlebury College; Deborah, a junior at Assumption; Kristin, a sophomore at St. Marks School, Southboro; and Liza, 3, at home.

val aviation intelligence serving on the *USS John F. Kennedy*, an aircraft carrier in the Eastern Mediterranean.

Jeff Trask has been working on a hazardous-waste refinery permit while on a temporary assignment at the Chevron U.S.A. refinery in Pascagoula, MS.

1982

MARRIED: Joseph Amarello to **Susan Keegan** on November 26, 1983, in Cranston, RI. He is an ensign in the U.S. Navy stationed at New London, CT. . . . **Christopher Lord** and Julia Odlin in Tacoma, WA. Julia graduated from Centenary College in New Jersey. Christopher is an electrical engineer.

MARRIED: William McGrath to Cheryl Steele in Worcester on November 5, 1983. She graduated from Boston University and is employed by Reed Plastics Corp. in Holden. He is with the Connecticut Department of Transportation in Hartford. . . . **Alfred Sawtelle** and Nancy Bibeault on October 29, 1983, in Blackstone, MA. Nancy graduated from St. Vincent Hospital School of Nursing. . . . **Timothy Stone** to Elaine Young on October 29, 1983, in Hudson, NH. Elaine graduated from Becker. . . . **Richard Wurm** and **Katherine Coghlan, '81,** on September 3, 1983, in Newton, MA. Richard is with New England Telephone in Brockton.

Richard Bame is an administrative assistant for Toyota Motor Distributors Inc., Englewood, CO.

Frank Bilotta works as new product project manager at Data General, Southboro, MA.

Andrew Buttress works for Hughes Aircraft Co. in Fullerton, CA.

Lewis Capobianco, who has his MBA from WPI, is project manager for the Barletta Co. Inc., Roslindale, MA.

Pat Doody is with Boston Edison in Braintree, MA.

Cynthia Gagnon is now a member of the technical staff at Bell Labs in Lincroft, NJ.

Lynn Gustafson is employed as a manufacturing process quality engineer for the GE Military Systems Electronics Operations in Syracuse, NY.

Charles Kincaid is a civil engineer for the Nevada Department of Transportation in Carson City.

Mike Kirschner is employed as a quality and reliability engineer at Intel Corporation, Santa Clara, CA.

Eric Krichbaum, formerly a project engineer for Westinghouse in Beaver, PA, has been transfered to Ashville, NC.

Mark Lepkowski works for the optics group at Gentex Corp., Dudley, MA.

Mary Elizabeth Martin is employed as a scientific programmer/analyst at Pratt & Whitney Aircraft, East Hartford, CT.

Paul Moruzzi is a mechanical design engineer for DEC in Maynard, MA.

Lawrence Moss works for Sperry Electronic Systems, Great Neck, NY.

MaryAnn O'Connor, formerly with Softech, is now at Prime Computer in Framingham, MA.

Sandra Paille is an associate mechanical engineer at Killmorgen Corp., Northampton, MA.

David Peternell serves as an associate programmer at IBM in Endicott, NY.

Ronald Pettit works for Bell Labs in Piscataway, NJ. Last year he received his MS in computer science from the University of Wisconsin.

Albert Reinhart holds the post of president at Ventec Management Group, Boylston, MA.

John Sansoucy is a product engineer for Design Components Inc., Franklin, MA.

Alfred Santos, an electrical engineer with the Torrington Company in Connecticut, and his wife, Susan Mae, live in Canton Center.

Prof. **Helen Vassallo,** of WPI's management and biology and biotechnology department, spoke before the Worcester branch of the Boston University Alumnae Association and the Pennsylvania chapters of the American Business Women's Association last October. In December, she was elected a new corporator of People's Bank, Worcester.

Brian Walker is with UTC in Springfield, MA.

David Webb is employed as an engineer II at Digital Equipment Corp., Marlboro, MA.

Loraine Webster is at Clark University.

Terry Wheeler continues with the Peace Corps in Honduras.

1983

MARRIED: Thomas Barrett and Colleen Walsh in Woburn, MA. She graduated from

Stoneham High School and is a secretary at the University of Hartford. He is with Pratt & Whitney Aircraft in Hartford. . . . **Paul Cotnoir** and Mary Bousquet in Putnam, CT, on July 9, 1983. She graduated from Becker and is a legal secretary. Currently, Paul is a graduate student at WPI. . . . **James Culliton, Jr.,** and Kathleen Farrell in Dalton, MA, on November 5, 1983. Kathleen graduated from Lasell Junior College and teaches at the Early Childhood Development Center in Pittsfield. Jim works for Allegrone Construction Co.

MARRIED: Peter Fontana, Jr., and Janet Sheehan in South Weymouth, MA. Janet graduated from Fitchburg State College and is a registered nurse at Brigham and Women's Hospital. Peter serves as a software engineer at Computervision Corporation. . . . **Paul Granger** and Stephanie Linek on September 18, 1983, in Worcester. A teacher at Nipmuc Regional High School, Mendon, MA, Stephanie graduated from Anna Maria College. Paul is an ensign with the U.S. Naval Reserve and is stationed at Saratoga Springs, NY. . . . **Rom Juozokas** and Sally Czarnecki in Pomfret, CT, on December 3, 1983. She graduated from Eastern Connecticut State University in Willimantic. He graduated from Assumption, has a master's degree in computer science from WPI and works as a software analyst with Sanders Associates in Nashua, NH. . . . **Laura Zarrella** and James Dion on October 1, 1983, in Fitchburg, MA. Laura is an electrical engineer with Polaroid Corp. Jim graduated from Sylvania Technical School and is a field engineer at Plessey Peripheral Systems.

John Baczewski is an associate engineer at Westinghouse Electric in Baltimore, MD.

Stephen Benner has accepted a post as manufacturing engineer with Texas Instruments, Attleboro, MA.

Carla Blakslee is a systems design engineer with Hamilton Standard in Windsor Locks, CT.

Andy Crosby is now employed by Nanometrics Inc., Sunnyvale, CA.

Nancy Fortier is a teaching assistant at Iowa State University in Ames.

Raymond Haarstick serves as an account executive with American Bell–Advanced Information Systems in Lexington, MA.

Linda Hall is a software engineer at Coulter Biomedical Research Corp., Concord, MA.

Susan Godbout Hersey is currently an engineer-in-training at EUA Service Corp., Lincoln, RI.

2nd Lt. **Timothy Horan** has completed an ammunition officer course at the U.S. Army Missile and Munitions Center and School, Redstone Arsenal, AL.

Jane Jaillet is a civil-engineering assistant with the County of Los Angeles (CA) Road Department. She resides in Manhattan Beach.

Michael Jasminski writes, "I am designing highways for the county of Los Angeles." He lives in Seal Beach, CA.

Leonard LaPadula works for Texas Instruments in Lewisville, TX.

Wayne Lawson has accepted a post as structural engineer at Lev Zetlin Associates, Boston.

David Lind is a design engineer at Teradyne in Boston.

Timothy Morse has accepted the post of engineer with the process engineering group of the technical department at Westvaco's bleached-board division in Covington, VA. He joined the company last June as technical assistant in the technical department. Briefly, he worked on assignments for power maintenance, then returned to the technical department.

Joseph Phelan works for GE Ordnance Systems in Pittsfield, MA.

Robert Plante is now with the Southern California Gas Company in Los Angeles.

David Rainone works as a field designer at Stone & Webster, Waterford, CT.

Robert Reinfurt is an industrial engineer at Simonds Cutting Tools in Fitchburg, MA.

John Salvadore works for Eaton Corporation. He is located in New Britain, CT.

Richard Seaver is employed as a manufacturing engineer at NEC Information Systems in Woburn, MA.

Ruth Sespaniak is a member of the technical staff at the Mitre Corp., Bedford, MA.

Paul Sydney serves as a second lieutenant and physicist for the U.S Air Force, Kirtland AFB, NM.

Michael Thys is a hardware instructor for Wang Laboratories Inc., Lowell, MA.

Richard Tolles is a computer engineer with MicroWare in Kingston, MA.

Michael Treglia is with the General Dynamics' Electric Boat Division in Groton, CT.

Charles Woodman works for GE in Louisville, KY.

School of Industrial Management

In October, **Peter Morgan, '55,** vice president of Morgan Construction Co., Worcester, received the 15th annual Bardwell H. Flower Award for his contributions on behalf of emotionally disturbed children. He was a member of the sesquicentennial committee of Worcester State Hospital, which celebrated its 150th anniversary last year. He is a former board member of the Child Guidance Association and is a director of the Worcester YMCA, the Worcester County Music Association and the Worcester County Mechanics Association. . . . **Guy Nichols, '56,** chairman, president and chief executive officer of the New England Electric System, has been appointed chairman of the 1984 U.S. Savings Bonds campaign for the public-utilities industry by U.S. Treasury Secretary Donald Regan. . . . **Bill Lechman, '64,** has been named president of the Fairfield Manufacturing Company Inc., a Rexnord company located in Lafayette, IN. Previously, he was director of manufacturing in chain operations for Rexnord's mechanical power division in Milwaukee. He joined Rexnord in 1956 at the firm's Worcester plant, then moved to Springfield, MA, as plant manager of the roller-chain operation.

Irvin Havens, '66, is now manager of product development at Bay State Abrasives in Westboro, MA. With the firm since 1957, he has served as manager of inorganic-product development and bonded abrasives since 1965. He will continue his responsibility for inorganic-product development. He is a registered professional engineer and a graduate of Alfred University, and he holds an MS in ceramic engineering from Clemson.

Roy Moffa, '77, program manager for Digital Equipment Corporation's 32-bit Micro's VAX computers, is joining Pixel Computer Inc., Wilmington, MA, as president and chief executive officer. From 1978 to 1980 he was manager of Digital's central engineering small systems group. He joined the firm in 1969 to help develop the original PDP-11 computer. His new firm, Pixel, manufactures and markets a family of super-mini-computer systems.

Natural Science Program

Frank Matarese, '60, has been appointed superintendent of schools in Stoneham, MA. Prior to his promotion, he had been assistant superintendent for a number of years. In 1950 he received his BA in social studies with a minor in education from UMass, as well as a master's degree in education from Tufts. After four years as a teacher–coach at Burlington Junior–Senior High School, he joined the Stoneham school system, where for 28 years he has been a teacher, coach and administrator. . . . **Kenneth Barrows, '64,** who has been chairperson for the science department at Gateway Regional High School, Huntington, MA, since the school opened in 1963, also teaches summer school at Smith College in Northampton. He graduated from UMass.

COMPLETED CAREERS

Edward Wright, '06, a retired sanitary engineer for the Massachusetts Department of Public Health, died November 25, 1983, in Norwood, MA.

He was born on Feb. 18, 1884, in Worcester and later studied civil engineering at WPI. After retiring in 1954 with 47 years' service with the Department of Public Health, he received a citation from former governor Christian Herter.

Mr. Wright was a town meeting member for 48 years in Dedham, MA, where he also had served as chairman of the town drainage and water committees. He was active with the local Episcopal Church. He belonged to SAE and the ASE, and he was a fellow of the American Public Health Association. Formerly, he was chairman of the state reclamation board. In World War I he served as a captain in the U.S. Army.

Edward J. Tucker, '12, a former hospital administrator, died in Worcester City Hospital on October 2, 1983, at the age of 93. He graduated from WPI as a civil engineer.

Early in his career, he was in charge of construction and administration of the water-purification plant at the Panama Canal. Later, he was a plumbing and heating contractor in New Haven, CT, and a consulting engineer in Montreal, Quebec, Canada. From 1924 to 1956, he

was supervising engineer for Worcester City Hospital and from 1956 to 1958, he was assistant superintendent at the former Belmont Hospital. Following his retirement, he was a self-employed design engineer. From 1917 to 1920, he was a major with the U.S. Army, attached to the Surgeon General's Office.

He had belonged to the ASME, the ASCE and the New England Water Works Association. He was a registered professional engineer and a member of the Tech Old-Timers.

F. Holman Waring, '12, a retired chief engineer for the Ohio State Department of Health, died recently. A native of Saratoga Springs, NY, he was born on October 5, 1890.

After receiving his BSCE from WPI, he joined Metcalf & Eddy. From 1916 to 1961, he was with the Ohio State Department of Health. He had served as assistant engineer with the City of Cincinnati's consulting engineers and as operating engineer and chemist for the U.S. government at water-purification plants in the Panama Canal Zone. For many years, he was secretary of the Ohio River Valley Water Sanitation Commission.

Mr. Waring, who belonged to PGD and Sigma Xi, served as best man at **Chet Inman's, '14,** wedding. He was a life member of the ASCE, the National Society of Professional Engineers, the American Water Works Association, the Water Pollution Control Federation and the American Public Health Association. A registered civil engineer and surveyor in Ohio, he was also active with the Camp Fire Girls Council and the Masons. In 1968, he received the Goddard Award from WPI.

C. Eric Waldo, '14, of Plainville, CT, died on December 15, 1983, following a brief illness. He was 91 and a native of Windsor Locks, CT.

After studying civil engineering at WPI, he enlisted in the 26th Yankee Division in World War I and received the Purple Heart in the battle at Chateau-Thierry, France. He had been associated with New Departure Mfg. Co. and Wallace Barnes Co., both of Bristol, CT. He was secretary-treasurer of Plainville Lumber & Coal Co. from 1924 until 1972. In addition to being active with the Boy Scouts, Mr. Waldo had been president of the local Community Chest and a director of the former Plainville Trust Co. He belonged to ATO, the Masons and the American Legion.

Thomas A. Coyne, '15, former superintendent of public works for the City of Marlboro, MA, passed away in Worcester on October 15, 1983, at the age of 90.

Mr. Coyne, who was born in Marlboro, graduated from Little Rock College, AR, and had a master's degree from Manhattanville College in New York. Until his retirement in 1963, he was general superintendent for the Carlo Bianchi Construction Co. Inc. for 27 years.

He had served as superintendent of public works in Marlboro and Framingham. A Marine veteran of World War I, he received the Purple Heart for service in France.

Robert E. Lamb, '16, died recently at his home in Deerfield Beach, FL. He was born in Worcester on September 30, 1893, and held a BSEE and a professional engineering degree from WPI.

During his career, he was with Norton Co., John Bath & Co. and Metal Cutting Tool Institute. From 1940 to 1959, he was president of his own firm, Republic Gage Co., Detroit. In 1960, he retired to Florida.

Mr. Lamb belonged to Sigma Xi, the Masons (Past Master), the American Legion (commander) and the U.S. Coast Guard Auxiliary. He was a former vice president of the Detroit chapter of the WPI Alumni Association and Council representative. A member of the ASME, he also was an emeritus member of the U.S. Department of Commerce, Business and Defense Services Administration.

Albert E. Luke, '16, formerly with Harrington & Richardson, Worcester, died in Gardner, MA, on December 23, 1983. He was born in Putnam, CT, on March 17, 1894.

After graduating with his BSME, he was briefly with Reed Prentice, Bethlehem Shipbuilding Corp., Scovell-Wellington and Geo. A. Vaughan & Co. From 1924 to 1954, he was associated with several affiliates of Sears Roebuck, including the former Florence Stove Co., which he served as an executive. From 1955 to 1962, he was executive vice president and director of Harrington & Richardson.

Mr. Luke, a member of Phi Sigma Kappa, was a 50-year member of the Masons and had belonged to the Controllers' Institute and the advisory board of the Westminster Industrial Development Commission.

Richard M. Daniels, '17, of South Yarmouth, MA, a retired instrument specialist with the WPI electrical engineering department, passed away on December 20, 1983.

He was born in Swampscott, MA, on Dec. 4, 1894. At WPI, he was concerned with electrical instrument maintenance and calibration. During World War II, he was a radio and electronics instructor. He belonged to ATO. In his spare time, he was an avid ham radio operator.

Leland A. Gardner, '17, of Summit, NJ, died on November 4, 1983. A native of Rutland, VT, he was born on Oct. 13, 1894.

After graduating as an electrical engineer, he joined the Navy and saw service on the *USS Pennsylvania* and the *USS Wisconsin*. Later he worked for AT&T, and then became chief engineer of the E.A. Laboratories in Brooklyn, manufacturers of automotive equipment. For a time he headed his own neon-sign business in Irvington, NJ. For many years, he was with the Bell Telephone Labs in New York City. He had several patents on wire printers and stock-quotation boards.

He was a member of Phi Sigma Kappa and a past president of the New York chapter of the Alumni Association.

Hartley C. Humphrey, '17, an electrical engineer who participated in the development of sound tracks for films during the infancy of the "talking" motion picture industry, died December 21, 1983, in Hanover, PA. He was 87 and a native of Brooklyn, NY.

As a boy, he had one of the first Marconi radio sets in New England. In World War I, he was a radioman in the U.S. Navy.

During his career, he worked for Western Union Telegraph Co., AT&T, Bell Telephone Labs, Warner Bros.-Vitaphone Corp., Electrical Research Products Inc., and Westinghouse Electric, International (Radio Communications & Broadcasting Dept.). He helped pioneer the first sound recording for a "talking" movie with *The Jazz Singer* in 1927. In addition, he worked with movie moguls Sam Goldwyn, Louis B. Mayer and Howard Hughes, and recorded famous artists for the Metropolitan Opera of New York.

A consultant to the English and German motion picture industries, he traveled extensively in Europe, as well as in Central and South America. During World War II, he helped develop the first high-speed tinplating process for Bethlehem Steel, helped refine automatic tank turret guns at Edgewood Arsenal and did X-ray work for Westinghouse.

He belonged to the IRE and the Society of Motion Picture Engineers. He was a member of the Masons and of the Society of the Cincinnati, which is comprised of direct descendants of officers on George Washington's staff.

Walker Armington III, '21, a Worcester native, died November 28, 1983, in Ridgewood, NJ, at the age of 84.

He studied mechanical engineering at WPI and received a bachelor's degree in economics from the Wharton School of the University of Pennsylvania in 1923. Before retiring in 1965, he worked 16 years at Dennison Mfg. Co. in Framingham and 25 years at Union Camp Corp., New York City.

Active with the Boy Scouts of America, he became president of his local BSA council and in 1960 received the Silver Beaver Award. He was an elder of the Presbyterian Church, a member of the Masons and president of Hobbyists Unlimited in Ridgewood.

Harold S. Black, '21, who was named to the National Inventors Hall of Fame in 1981 for discovering one of the most important concepts in the field of electronics and long-distance communications, died December 11, 1983, in Summit, NJ. A scientist and engineer with AT&T Bell Laboratories until his retirement in 1963, Dr. Black was 85.

On August 6, 1927, while traveling by Lackawanna ferry to his New York City laboratory, Dr. Black conceived the theory of "negative feedback"—the long-sought solution to problems of distortion in the amplification of communication signals. He used a page of the *New York Times* to sketch a negative feedback circuit.

In negative feedback, part of the communication signal coming from an amplifier is fed back and compared with the original signal so that distortions can be pre-corrected and largely eliminated. The feedback theory fostered development of automatic control systems and the basic principle came to be regarded as one of the cornerstones of modern engineering. The principle found application in high-fidelity sound reproduction and in such diverse fields as biomechanics, digital computers and artificial limbs for the disabled. The initial patent awarded to Dr. Black was one of 347 patents he was granted.

"Harold Black's invention was one of the great engineering accomplishments of all time," said William H. Doherty, a retired director of research at AT&T Bell Laboratories.

Dr. Black was born in Leominster, MA, on April 14, 1898. In addition to his BSEE, he received an honorary doctorate in engineering in 1955 and the Goddard Award in 1981 from

WPI. He belonged to Sigma Xi and Tau Beta Pi.

He joined the Western Electric Engineering Department in 1921. In 1925, at Bell Labs, he was in charge of a group that was developing repeaters and other circuits for carrier telephone systems. He retired as head of Special Communications Research.

During World War II, he designed pulse code modulation systems, which today are used widely by the military and by private and public communications companies.

Among his many awards are the National Association of Manufacturers' "A Modern Pioneer" award; the Lamme Gold Medal from the AIEE; the John H. Potts Memorial Award from the Audio Engineering Society; and the John Price Wetherill Medal from the Franklin Institute. He authored two books, 22 encyclopedia articles and numerous scientific papers.

Charles N. Clarkson, '22, a retired Pacific Gas & Electric Co. (PG&E) supervisor, died in Stockton, CA, on January 2, 1984. He was 84 and a native of Cambridge, MA.

With PG&E from 1923 until his retirement in 1964, he graduated as an electrical engineer from WPI. He was a World War I Army veteran.

Mr. Clarkson, a member of the Masons for 59 years (Past Master, Knight York Cross of Honor), was active with SIRS (Sons in Retirement). He was a past president of the state of California High Twelve Clubs. He belonged to the California Society of Professional Engineers.

Wayne E. Keith, '22, a WPI trustee emeritus, died in Brockton, MA, on February 15, 1984, at the age of 83. He was born in Boston and received his BSEE from WPI.

Mr. Keith worked for the Bell System for 40 years in engineering, administration and personnel. He started his career as a student engineer with Bell in Pennsylvania, then served in engineering positions for New England Telephone in Boston from 1923 to 1955. For nine years, until his retirement in 1964, he was general employment and training supervisor for the Boston-based company.

He was the permanent president of the Class of '22, a former vice president of the WPI alumni association and past president of the Boston alumni chapter. From 1955 to 1978, he was a member of the WPI Board of Trustees. He was the first alumnus to serve as chairman of the board, doing so from 1963 to 1968.

While Mr. Keith was chairman of the board of trustees, five major campus buildings were completed: Daniels Hall, Goddard Hall, George C. Gordon Library, the administrative center at Alden Research Laboratory and Harrington Auditorium. It was during his tenure that WPI began moving toward changes in the academic program which led to the development of the WPI Plan.

In recognition of his many contributions to WPI, the college awarded him an honorary degree of doctor of engineering in 1966. In 1972, the Alumni Association presented him with the Herbert F. Taylor Award. WPI's ROTC appointed him to the honorary rank of cadet colonel in 1964.

In 1983, the Keith Lecture Hall in Atwater Kent was dedicated in his honor. The last paragraph on the dedication plaque reads: "Wayne Keith wore the mantle of responsibility with grace, dignity and humility. He led by soft-spoken persuasion and by example. He has always been, above all else, a gentleman."

Mr. Keith belonged to Phi Gamma Delta and Skull, as well as the ASEE, the Eastern College Personnel Officers Association, the IEEE, the Newcomen Society of North America, the Thorny Lea Golf Club and Beverly Yacht Club. He had been active with the Boston Community Fund and Red Cross fund-raising drives. A Mason, he had also been past president of the Cambridge Kiwanis Club, the '76 Club of Boston and the Personnel Managers Club of Boston. He was active with local and state councils of the YMCA.

A trustee emeritus of Brockton Hospital and People's Savings Bank, he was also a founder of the Brockton Historical Society, a director of the Republican Club of Massachusetts and a member of the Congregational Church of Brockton. During World War II, he was assistant director of the New England District of Training Within Industry.

James A. Whelpley, '23, of Cincinnati, OH, died recently. He was born on November 15, 1900, in New Brunswick, Canada, and received his BSME from WPI.

Early in his career, he worked for Public Service Electric & Gas Co. of New Jersey. From 1929 until his retirement, he was with Cincinnati Gas & Electric Co., serving as superintendent of distribution, then as assistant manager of gas operations and as manager of gas operations.

He belonged to the American Gas Association, the Cincinnati Engineering Society, Poly Club, Lambda Chi Alpha, Tau Beta Pi, Sigma Xi and Skull. He was a past master of his local Masonic Lodge and a Scottish Rite trustee.

Luther B. Martin, '25, of Westfield, NJ, a retired manager of staff engineering for Esso Research and Engineering Company, died on December 20, 1983, at the age of 79. He was a native of Chaplin, CT.

In 1925, he graduated as a civil engineer from WPI, and joined Esso, from which he retired in 1961. During World War II, he was project manager on the construction of critical butyl plant projects and the alcohol projects at Baton Rouge. He was the project manager for Esso refineries in England, South Africa, India, Norway, Italy, France and Germany. During his last four years with the firm, he was responsible for the coordination of all major capital projects handled by Esso Engineering.

Mr. Martin was a member of the Presbyterian Church, the Echo Lake Country Club, SAE, Tau Beta Pi, Sigma Xi and the Poly Club. He was a past president of the Northern New Jersey chapter of the Alumni Association.

George L. Esper, '27, a former public works engineer, died July 23, 1983, at St. Vincent Hospital in Worcester. The Worcester native was 78.

In 1974, he retired from the Massachusetts Department of Public Works, following 44 years of service. Originally with the Metropolitan District Commission, in 1930 he joined the state Department of Public Works in construction of the Boston-Worcester turnpike and the Southwest cutoff. After the flood of 1936, he designed bridges. In 1948, he was promoted to senior supervising engineer.

He belonged to the Massachusetts Society of Land Surveyors, the state Society of Professional Engineers and the Syrian-Lebanese-American Association of Worcester. He was a co-founder of Our Lady of Perpetual Help Church.

J. Kendall Fullerton, '29, retired sales manager for Simonds Saw and Steel Co., Fitchburg, MA, died at his home in Evanston, IL, on October 10, 1983, at the age of 75. He was born in Willimantic, CT, and received his BSEE from WPI.

He retired in 1971 after 42 years with Simonds. During his career, he had held posts in engineering and sales engineering, covering territories from Louisiana and Mississippi to the Midwest. He was sales manager in Chicago. In 1965, he was promoted to sales manager of Simonds's largest branch office in Union, NJ. For the past eight years, he had been a "Right to Read" tutor in the Glenview, IL, public schools. He belonged to Phi Sigma Kappa.

Frederick J. McGowan, '29, a founder of the American Historical Print Collectors Society, died in Connecticut on December 9, 1983. A graduate electrical engineer and former professional engineer, he was born on December 2, 1907, in Springfield, MA.

During his career, he was an assistant engineer for New York Telephone, an assistant chief inspector for Anaconda Wire & Cable, the owner of McGowan Associates and a senior test equipment designer for Pratt & Whitney Aircraft (P&WA). While with P&WA, he designed exotic rigs for the testing of advanced jet aircraft engines. He took early retirement in 1970, devoting much time to his hobby of collecting antique prints, and restoring damaged prints, including rare Currier & Ives varieties.

He belonged to Phi Gamma Delta, the ASME and the IEEE, and he had been a director of the Madison Historical Society and of the Dorothy Whitfield Historical Society. He was a former president of the New York chapter of the WPI Alumni Association, as well as a member of the Alumni Council.

Herbert W. Davis, '30, died at his home in Boynton Beach, FL, on October 29, 1983, at the age of 76. He was born in Holyoke, MA.

After graduating as a mechanical engineer from WPI, he was involved with the tractor business for 50 years. He had been associated with the H.F. Davis Tractor Co., Shaw Transmission Co., Berkshire Tractor Co. and Cleveland Tractor Co. (the Oliver Corp.). In 1952, he became a partner and owner of the Triumph Machine Company, Hackettstown, NJ. Later, he was vice president of research for Brunt Equipment Co., from which he was retired.

Mr. Davis belonged to Phi Sigma Kappa, the ASME and the Masons. He had been a member of the Hackettstown Board of Adjustment, treasurer of the local Lions Club and a board member of the Methodist Church. He was a past president of the Industrial Equipment Manufacturers Council, a national trade association. At the time of his death, he was writing an autobiography of his years in the tractor business.

Everett M. ("Casey") Jones, '32, of Ardmore, PA, a partner in Jones & Malloy, died on October 26, 1983. He was born on June 14,

1908, in Philadelphia.

After studying at WPI and Lehigh, he joined Simplex Valve & Meter Co., where he advanced to executive vice president. While with Rockwell International in Pittsburgh, he rose to vice president. Later he formed his own consulting firm and was a consultant to Pennwalt Corporation in Philadelphia.

An authority on water problems, Mr. Jones was a past president and a director of the Water and Wastewater Equipment Manufacturers Association. He was a life member and officer of the American Water Works Association, which presented him with its Fuller Award in 1976.

A member of the Union League, he was chairman and secretary of the League's Hearth Club. He belonged to the Engineers Club of Philadelphia, the Railroad Machinery Club of New York, two country clubs, the Masons and Phi Gamma Delta. He was an avid student of the Revolutionary War.

Eugene W. Somerville, '32, of Mount Carmel, CT, passed away on October 25, 1983. A native of Clinton, MA, he was born on April 11, 1911.

After receiving his BSEE from WPI, he worked for Bigelow Sanford Carpet Co., where he rose to assistant chief engineer. In 1942, he joined United Illuminating Co., New Haven, as a test engineer. In 1960, he became general superintendent and five years later he was elected vice president of operations and engineering. He retired in 1974.

Mr. Somerville belonged to Tau Beta Pi and Sigma Xi, and he was a past president of the New Haven chapter of the Alumni Association. In 1962–63 he was a district keyman for the Alumni Fund. He had been a director of the executive board of his local Boy Scout council.

Albert H. Ensor, '33, died in Brewster, MA, on October 8, 1983, following a long illness. A graduate electrical engineer, he was born in Brockton on August 28, 1911.

In 1974, he retired as superintendent of communications and controls for the New England Electric System following 39 years of service. He belonged to the Brewster Men's Club, the Church of the Holy Spirit, Theta Chi and the Masons.

George A. Stevens, '34, a retired field manager for Industrial Risk Insurers, passed away recently. He was born in Worcester on May 24, 1912, and received his BSEE from WPI.

Following graduation, he joined the Factory Insurance Association, now Industrial Risk Insurers. In 1938, he was named as a supervisor. Appointed executive special agent in 1950, he assisted in the supervision and handling of nationwide accounts in the broadened program department. In 1976, he retired as field manager for the firm's Pittsburgh territory.

Mr. Stevens was a member of Phi Gamma Delta, Tau Beta Pi and Sigma Xi.

John B. Tytula, '34, of Vero Beach, FL, died September 5, 1983. He was a native of Austria.

A civil engineer, during his career he was employed by the Worcester County Highway Department and he worked for many years for the Maps and Surveys branch of the Tennessee Valley Authority in Chattanooga.

Stephen A. Lincoln, '39, died at his home in Oakham, MA, on November 27, 1983. He was born in North Brookfield on July 30, 1912. In 1939, he received his BS in chemical engineering from WPI.

For more than 20 years, before retiring in 1977, he had been a research chemist at Anken Chemical & Film Co., Williamstown, MA. Other employers had been Defender Photo Supply and Du Pont, both in Rochester, NY. Mr. Lincoln, who had a BS degree from UMass, belonged to Phi Sigma Kappa.

John H. Newton, '40, former general superintendent of U.S. Steel's Worcester works, died November 25, 1983, in Brunswick, ME. He was born in Millbury, MA, on Nov. 1, 1917.

An electrical engineer, he joined New England Power following graduation. He also worked for the U.S. Navy Yard in Portsmouth, VA, and for Stone & Webster in Boston. For more than 30 years, he was with U.S. Steel's American Steel & Wire Division in Worcester. He retired in 1978 as general superintendent.

Mr. Newton belonged to Phi Sigma Kappa, the Poly Club, the Masons (32nd degree), the Sutton (MA) Men's Club and the Republican town committee. He was active with the Episcopal Church and had served as president of the Harpswell-by-the-Sea Association.

William D. Crosby, '46, of Easton, MA, died last July at the age of 57.

A native of Lenox, he attended North Adams State College and Boston University School of Law, where he was note editor of the *Law Review* from 1949 to 1950. He started his career as an attorney with Waltham Watches. Later, he opened a private practice in Brockton, which focused on wills, trusts, taxation, business and banking law.

He was a member of the Plymouth County, Massachusetts and American Bar associations. He also belonged to the American Civil Liberties Union, the National Organization for Women and the Cohasset Dramatic Club.

Edmund J. Eager, '48, an electrical engineer for Westinghouse, died October 29, 1983, in Mount Lebanon, PA, at the age of 58.

With Westinghouse for 35 years, Mr. Eager was a graduate electrical engineer. He had an MBA from NYU. He belonged to ATO and PDE. In World War II, he served with the Navy, and he belonged to the American Legion.

John M. Petrillo, '48, an engineer for IBM in Waltham, MA, for the past 18 years, died at his home in Needham on October 5, 1983. He was 59.

A native of Lynbrook, NY, he received his BS and MS in chemical engineering from WPI. Prior to joining IBM, where he had been a marketing representative, he had been a sales engineer for the Foxboro Co. He belonged to PKT and PDE. During World War II, he was an electronics technician with the U.S. Navy. He was the father of **James Petrillo, '76, John Petrillo, '71,** and **Joseph Petrillo, '86.**

Kenneth R. Neale, '49, died at his home in Middlebury, CT, on January 8, 1984, at the age of 58.

He was born in Waterbury, CT, and graduated with a BSEE. Following graduation, he joined Connecticut Light & Power Co. He retired last June as vice president of marketing for the Bristol-Babcock Co. in Waterbury. He served with the U.S. Navy in World War II and the Korean conflict.

A member of the Middlebury Conservation Commission, he had been President of the Ostomy Association of Waterbury and a board member of the Waterbury unit of the American Cancer Society. He was a 32nd degree Mason and a Shriner. A member of the Waterbury Club, he also belonged to the Watertown Golf Club, the Episcopal Church and the Ice Harvester Association of America. He had served as chairman of his local Boy Scout troop. Other affiliations were with the AIEE, Phi Sigma Kappa and the ISA.

Paul R. Conlin, Jr., '63, of Attleboro, MA, died at his home on September 16, 1983. He was born July 13, 1941, in Worcester.

In 1963, he graduated as a chemical engineer from WPI. In 1965, he received his master's degree from UMass, Amherst. A consultant, formerly he was employed by Texas Instruments in Attleboro. He belonged to ATO and the AIChE. A U.S. Army veteran, he had served in Korea.

Jeffrey W. Thwing, '65, a civil engineer with the air quality division of the Department of Transportation, died on October 14, 1983, at the George Washington University Hospital in Washington, DC. He was 40 and a native of St. Paul, MN.

After graduating with his BS from WPI, he received his MSCE from the University of Rhode Island. He joined the transportation department in 1966 in Montana, transferring to the Washington area in 1969.

A licensed professional engineer in Colorado, he also belonged to SAE and the Methodist Church. He was active with the Boy Scouts and enjoyed gardening.

Lt. j.g. **Mark R. Caldwell, '81** (USN), was declared dead after searchers failed to find any trace of his body when his plane was lost over the Mediterranean Sea on Thanksgiving Day. He was 24.

A native of Attleboro, MA, Caldwell graduated as a mechanical engineer from WPI. He received his commission in the Navy through the Naval ROTC program at Holy Cross. In 1983, he was designated as a naval aviator, after completing flight training at Naval Air Station, Chase Field, Beeville, TX. After completion of C-1A transition training at Naval Air Station, North Island, San Diego, he reported aboard Transport Squadron 24, Sigonella. He belonged to Alpha Phi Omega.

Correction

In the February *Journal*, we reported in the story on the new WPI Athletic Hall of Fame that Raymond Forkey, '40, one of the Hall's eight charter members, is the only WPI athlete to have earned 12 letters. Checking the record books, we find that two other athletes, Robert Cotton, '29, and Earl Bloom, '54, did indeed better Forkey's marks. Cotton, as far as we can tell, earned 13 letters—in basketball, tennis, soccer and golf. Bloom, who earned 15 letters—in football, basketball, track and tennis—remains WPI's most decorated letterman. We hope we've not caused either of these alumni any distress by our oversight. Our congratulations to all three.

continued from page 5

ming, in how we talk to machines, in how we solve a host of problems.

But one thing is clear: developments will not come easily. They didn't come without a struggle for Gutenberg, either.

Today, we can store the equivalent of all of the Manhattan telephone directory on a chunk of material about the size of a postage stamp. In order to build such a memory technology, we must draw circuit logic on the material with lines about one-micron wide. A micron is 1/25,000 of an inch; a human hair is about 40-microns wide. But we cannot depend on conventional, light-dependent instruments to draw such narrow lines. Instead, methods using X-ray energy are called into play. And even smaller, faster computers are promised, requiring even more exotic manufacturing techniques, such as using an electron beam, able to make lines thinner than a human nerve fiber, to draw circuit logic.

Computing speed, too, is improving dramatically, in concert with the size of our most advanced computers. Today's computers are built on nanosecond—one-*billionth* of a second—technology, where electric circuits make switches in a few to thousands of nanoseconds. Yet even faster computers may be needed soon. Recent experiments have shown that the technology needed for picosecond—*trillionth* of a second—systems is not far off. How much time are a nano- and a picosecond? Well, light travels about a foot in one nanosecond, and a picosecond is to a second what a second is to 31,710 years.

These phenomenal speeds enable, in large part, dramatic reductions in the size of the most advanced computers. Conversely, machines must be designed to accommodate the comparatively short distances electricity covers in a nano- or picosecond.

But what about the interaction between machines and people? What have you done for me lately, one might ask?

Most conventional programming languages, like Fortran, Cobol and Basic, which were written for educational and professional applications, are far too complicated for general use. Until recently, the inherent complexity of managing information was handled by the user. Fortunately, burgeoning markets for personal computing have created a demand for transferring a great deal of that complexity to the computer itself, thus making access to computers easier for everyone. As the philosopher and theologian Martin Buber put it, "It is more important that the machine reflect our humanness than we become the mirror of the machine."

Buchrach

Dr. Louis Robinson is Director of University Relations at International Business Machines (IBM) Corporation.

As a result of this demand, there has been a surge in research devoted both to creating a better understanding of information processing and to developing the most efficient products most economically.

There evolves from these considerations a natural, evolutionary change in the relationship between industry and education, a change rooted deeply in the economic realities of our times. Faced with declining U.S. competitiveness in worldwide markets, our professional societies, the National Science Foundation, companies and universities are all looking for more effective bridges for building research cooperation.

Many in the academic community seek science for the sake of science. But many also seek to make the knowledge gained through research benefit all of society. For the latter to occur, for us all to develop wider perspectives, without jeopardizing the unique role of each, we need to increase the dialogue between those who create the science and those who apply it.

But the interdependence doesn't end with dialogue alone. Industry needs to have access to a pool of well-trained scientists and engineers. Corporations employ 60 percent of U.S. scientists, and our needs are growing.

We also rely heavily on university research that creates the new materials industry needs in its quest for lower costs and better performance. Similarly, no university, no matter how large or rich, can possibly expect to replicate in its entirety the modern high-technology industrial environment. Obsolescence, too, takes its toll on university budgets.

Think of it this way: An apprentice to a seasoned boot-maker can indeed learn to make the next pair better than anyone else. But if there is a surprise or unexpected twist—so frequent in technology—the apprentice cannot fall back upon core-curriculum knowledge to solve unprecedented problems. New and formal scientific or engineering training is an essential element of the repertoire of today's effective problem-solver.

Historically, the use of technology has been largely the private domain of those who developed it. Probably, for example, few nations other than England, France or the U.S. could have built the Panama or Suez canals.

But the computer is different. Once it exists anywhere, it exists everywhere. There are students working at terminals in Worcester, in Chicago, in London, trying to understand genetic principles or integrated circuits. But there are also students in Bangkok and Addis Ababa, often connected by satellite, using the same technology to solve the same problems. The computer has a great leveling effect in making nearly everyone "information literate."

This new technology will be as pervasive as Gutenberg's. But its real impact (far more so than the endless automated gadgets it will enable)—and the creative challenge *all* of us face—will be in changing the way we *think* about information and the sources of that knowledge, be they in science or engineering, in driving the kids to dance class and preparing meals, or in privacy or law.

Picture Gutenberg, who has just invented movable type. To the few monks then able to read and write, he says, "We're going to use this technology to put on everyone's breakfast table three pages of listings of the opening asked, bid and closing prices of every stock on the New York Stock Exchange." But in 1460, of course, there was not even a New York, let alone a newspaper or stock market. Likewise, predictions of the computer's potential may seem today just as outrageous as the ones hypothetically assigned to Gutenberg.

Like movable type, the computer's potential is limited only by our imaginations. It's like handling an artist a palette that includes an infinite spectrum of colors, even invisible ones, like ultraviolet or X-rays; or a composer a set of musical notes and harmonics and chords, some of which have never been played before; or a poet an alphabet of infinite scope. It is a tool for the realization of ideas.

Make it a family affair.

REUNION 1984

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The Higgins House Then and Now

Unraveling Rainbows

WPI Journal

WORCESTER POLYTECHNIC INSTITUTE

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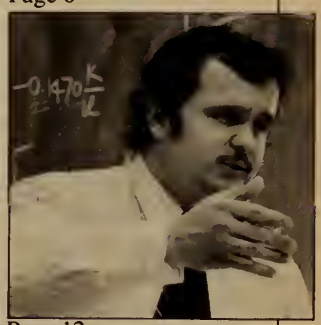

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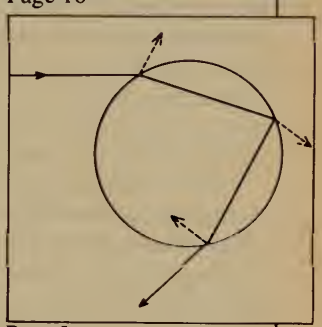

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Cover: Bob Cruickshank and Aman Khan eye an holography experiment that measures the vibration of jet-engine turbine blades. Photo by Michael Carroll. Opposite: The elegant south window of the Great Hall at the Higgins House, lush with springtime ivy. Photo by Michael Carroll.

BOOKS

Washington's Best Kept Secrets:
A U.S. Government Guide to International Business

By William Delphos, '74 MG
Publisher: John Wiley & Sons, New York, 1983

by Ruth Trask

In *Best Kept Secrets*, his 270-page international business guide, Bill Delphos, '74 MG, not only cuts red tape, he also cuts the mustard. His informative "how-to" manual, which should be required reading for would-be international entrepreneurs, is opening doors in Washington, DC, and in business communities around the world.

Described in business circles as "a 32-year-old whirlwind," Delphos has come through with a first publishing venture that has been termed "astounding." To conceive and produce a book in less than a year is a feat almost unheard of in the publishing world, let alone in the molasses-like mire of government bureaucracy. But the book was one whose time had come, and the first printing of 10,000 copies is already exhausted.

"The guide is designed to unscramble the scores of U.S. government programs available for American firms seeking to do business abroad," says Delphos. The idea for the project jelled when he came across studies showing that the average U.S. businessman had only the foggiest idea of how government programs could help him get into the export business.

"There were countless books covering exporting," he continues, "but not a single one offered a simple, how-to guide. The American businessman had to go to Washington and see a dozen mega-agencies. There was no central information point."

To remedy the situation, Delphos, who is vice president of operations for the Washington-based Overseas Private Investment Corp. (OPIC), took on the job

Bill Delphos and President Ronald Reagan

of putting together a one-stop guide to international business. The result of his collaboration with seven government trade agencies is a tightly edited manual outlining markets, opportunities, travel preparations, feasibility studies, regulations, financing, investments and training. It gives names, phone numbers, addresses and costs. Most importantly, it uses the direct "supermarket" approach—listing the services available (e.g., direct loans) and the administering agencies much as a supermarket displays products by brand name labels that also identify the manufacturer.

"If a company wants to export its product, it can identify sources of market information, specific countries where that product should find ready acceptance, and what the U.S. government offers by way of assistance, without spending two weeks on the phone to Washington," Delphos explains.

Interspersed with the nuts and bolts are stories of companies and entrepreneurs who have taken advantage of various government programs and succeeded. For example, Kentron International of Dallas, through the efforts of the Commerce Department, is upgrading the Pakistan Railway communications system under a $50 million contract. The Department of Agriculture helped U.S. tanners enter the China leather market, increasing sales from $49 million to $65 million within two years. A feasibility study grant helped LEMCO Engineers of St. Louis, MO, win a $9 million contract for engineering high-voltage transmission lines in Bangkok.

OPIC, Delphos' agency, has itself guaranteed loans for numerous international ventures. For instance, it guaranteed a loan to establish a Caterpillar Tractor equipment dealership in Honduras, insured an AMF investment in sports equipment manufacture in China, and backed a three-year program to train management executives in Southern Asia in the use of American technology.

One small businessman found listed in the guide a simple booklet that gave him the opportunity to latch onto a foreign-government contract in the health industry. "He isn't classified as a 'small' businessman any longer," Delphos smiles.

Secrets also outlines a Small Business Administration program that gives free legal counsel for the first-time exporter. It reports that between the Departments of Agriculture and Commerce there are 21 overseas offices that the U.S. businessman can use for $50 a day or less, including secretarial, clerical, marketing assistance, Telex and telephones. It also details such obscure policies as a Department of Agriculture program that provides American companies with cash allowances for point-of-purchase displays in foreign countries.

Last November, *Washington's Best Kept Secrets* was launched during a spectacular 50-city video conference attended by 5,000 businessmen interested in doing business around the world. Called "Operation Opportunity," the conference was co-sponsored by the seven government agencies which collaborated on the guide, plus several private sponsors, including *Fortune* magazine, Deloitte Haskins & Sells, and John Wiley & Sons. Well-known TV personality Edwin Newman served as moderator.

While Delphos deservedly takes the credit for conceiving and editing the fast-selling *Secrets*, he admits that his wife, Betsy, came up with the title. "The title sounds a bit more provocative than the material, don't you think?" he laughs.

NEWS FROM THE HILL

Joseph Glasser, '35 EE

Peter H. Horstmann, '55 ME

William Delphos, '74 MG

Three Alumni Elected to Trustee Terms

Effective July 1, 1984, three alumni were elected to serve on the WPI Board of Trustees. Joseph Glasser, '35 EE, an incumbent, will serve a second five-year term, until June 30, 1989. William A. Delphos, '74 MG, and Peter H. Horstmann, '55 ME, will each serve an eight-year term, until June 30, 1992.

Delphos, who holds an MBA from Northwestern University (1976) is vice president for operations of the Overseas Private Investment Corp., Washington, D.C. He is also editor of *Washington's Best Kept Secrets*, a government guide to international business (see review, page 2); chairman of Operation Opportunity, a presidential program to help American firms win in overseas markets; and a former board member of Gould, Inc. He is an Alumni Fund head agent. While a student at WPI, he was president of the Interfraternity Council and a member of Skull. He is also a member and past section chief of Phi Gamma Delta fraternity.

Glasser is a consultant and the director of the Center for Business and Industry at North Essex Community College, Haverhill, MA. He is also a retired vice president of Raytheon Co. He received an honorary doctor of science degree from the University of Lowell in 1973 and in 1978 won WPI's Robert Goddard Award for professional achievement. He serves on the boards of several organizations, including the Lawrence (MA) General Hospital, Andover (MA) Memorial Library, and Lawrence (MA) Savings Bank. He is also vice president of the Haverhill Chamber of Commerce. A member of the WPI Board since 1979, Glasser also sits on the advisory board at WPI's Department of Management.

As an alumnus, Horstmann has been active in WPI affairs since 1965, when he began serving on the alumni board of Sigma Phi Epsilon fraternity. He was president of the WPI Alumni Association (1981–83), was a member and later chairman of the Alumni Fund Board (1971–78), and won the WPI Herbert F. Taylor Award in 1980 for distinguished service to his alma mater. In his undergraduate years, he was senior class president, member of Skull and Tau Beta Pi, and co-captain of the undefeated 1954 football team. He has served on the boards of the Holden (MA) school and Wachusett regional school districts. He also referees college football games throughout New England. Horstmann is vice president of Coppus Engineering Corp., Worcester, and president of Suburban Driver Service, Ho-Ho-Kus, NJ. He earned an MBA from Western New England College in 1964.

The college is indeed fortunate to have these three outstanding individuals on its Board of Trustees.

Comings. . . .

As we went to press, Director of Admissions Roy Seaberg, '56 ME, reported that WPI will welcome in September a freshman class that upholds the academic quality of the past several incoming groups. In terms of applicants who have accepted admission, the overall number is down only a handful, to 662, from last year's record 667—this in the face of declining demographics across the nation and especially in the Northeast.

"For the past five years," says Seaberg, "the average SAT scores of all incoming WPI freshmen have stood at 650 math (men, 640 women) and 530 English (men and women), out of a possible perfect score of 800 on each test. This is a positive sign that we are at least maintaining quality in the face of declining SAT scores nationwide."

Other statistics: Of the current 662 acceptances, 54 percent hail from Massachusetts, 68 percent from New England. Both percentages are roughly the same as in the 1983–84 school year. Foreign students make up about 6 percent of the class,

Michael Carroll

As work nears completion on the renovated and enlarged Washburn Shops, some departments, such as Materials Engineering and Management, have already moved back into the building. Here, a mason lays up brickwork for the Shops' new main entrance, which opens onto Freeman Plaza. Rededication is scheduled for early autumn.

and women 20 percent (again, about equal to last year's figures).

Overall, of those indicating preferred areas of study, 26 percent have pointed to electrical engineering, mechanical engineering 14 percent, computer science 12 percent, "undecided engineering" 10 percent, and any of the science/mathematics programs 8 percent in total.

Sons or daughters of alumni number 19 in the class, and 3 grandchildren of alumni will enter WPI in September. More than 140 relatives of current students will also be matriculating for the first time in the fall.

"Although we went to our waiting list to bring in the class size we desire," Seaberg says, "we've done so for three of the past four years as well. There's nothing unusual about this, except that this year we planned for it."

. . . And Goings

WPI's 573 degree recipients at the 116th Commencement received more than a diploma. They also got a copy of David McCullough's *The Great Bridge*, the award-winning story of the building of the Brooklyn Bridge. With it they got a homework assignment from President Edmund T. Cranch. "This is both a final academic gesture," Cranch said, "and a way to make sure you read at least one book after graduation.

"There's a catch, though," he added. "You'll be quizzed on the book at your fifth reunion."

Bachelor of science degrees were awarded to 471 seniors. Another 64 received master of science degrees, five the master of mathematics, and four the doctor of philosophy. In all, since May 1983, degrees awarded by WPI total 755, of which 601 were the bachelor of science.

Honorary doctorates were awarded to commencement speaker Dr. John Lott Brown, '46 EE, president of the University of South Florida; Dr. Ray E. Bolz, immediate past vice president and dean of the faculty at WPI; the late Charles C. Bonin, '38 CE, a civil engineer business executive and former WPI trustee; and David McCullough, writer-historian.

Firla Appointed Publications Committee Chairman

William J. Firla, Jr., '60 ME, has been appointed chairman of the WPI Alumni Publications Committee by Alumni Association president Harry W. Tenney, Jr., '56 ME. Firla succeeds Donald E. Ross, '54 ME, whose term expired June 30. Firla, a consulting systems engineer for IBM, is a former chairman of WPI's Public Relations Advisory Committee. He is a resident of Needham, MA.

Ross had served as chairman of the committee since 1981. He is executive vice president of MPB Corp., Keene, NH, a maker of precision bearings.

The Publications Committee acts as an advisor to the editor of the WPI *Journal*, providing critical analysis of current and planned issues of the magazine as well as advice on publishing direction and production policy.

Currently, three alumni sit on the Committee besides the chairman. In the next year, however, additional members will be added to broaden the perspectives and geographical representation of the group. If you know of any alumni who you think may be qualified to serve on this body, we encourage you to contact Mr. Firla (130 Tower Ave., Needham, MA 02194) or Mr. Tenney (74 Gulf St., West Long Branch, NJ 07764).

(Editor's Note: Working with the Publications Committee under Don Ross's leadership has been a pleasure, and I anticipate more of the same with Bill Firla as chairman. As editor, I value each member's efforts on behalf of the college. And I want especially to recognize the contribution Don has made to WPI and the help he has given me so selflessly as Committee chairman, colleague and friend. Thanks, Don!)

Roger Perry

As if the traffic wasn't bad enough on May 19 at the corner of Park and Salisbury streets, what with WPI Commencement and the Worcester Craft Center Fair that afternoon in the same neighborhood. Actually, these two houses made their way quite nicely that day from Dean Street to new foundations on a site off Salisbury Street near Assumption College. To make way for WPI's soon-to-be built Residence Hall 6, two couples, WPI students Vincent and May-Shun Pawlowski, and Mr. and Mrs. William Gillin, paid the college token amounts for the houses, rather than see them razed. It took workers all day and half the night to move enough utility wires and tree branches to finish the job. And although the Pawlowskis and the Gillins didn't know each other before this venture, they certainly do now.

Spring Sports Wrap-up

Hammer-thrower Pete Sifferlen's (Sudbury, MA) all-America performance and second-place finish at the Division III NCAA Track & Field Championships highlighted a successful spring sports season at WPI.

Sifferlen, a two-time all-America, and high-hurdler Dan Pond (Grafton, MA) qualified to participate in the Nationals held at Carleton College, Northfield, MN. Sifferlen, who finished fourth in 1983, had a best throw during the finals, 179–4, that fell just two feet behind the eventual winner but did earn him all-America honors for the second consecutive year. Pond, who set a Division III New England record in early May, didn't qualify for the finals in the 110-high hurdles.

The men's track team enjoyed a banner year, finishing 8–2 for its 14th consecutive winning season. Coach Merl Norcross's squad captured the City Championship Meet and finished a strong fourth at the Division III New England Championships. Five individuals, plus the 4×100 relay team, garnered all-New England honors.

The women's club crew team added excitement to the spring, as well. The varsity four-boat placed second at the Dad Vail Regatta in Philadelphia and brought home a silver medal. The Engineers crossed the finish line just six seconds behind Coast Guard in the final heat.

Another club team, men's lacrosse, distinguished itself as the laxmen won their last seven games to finish 9–4 and claim the Pilgrim League championship. WPI had an unblemished 5–0 League record, including a season-ending 11–10 overtime win over Providence that decided the championship. Bill Zagrany (Westfield, MA) paced the scoring attack with 36 goals and 9 assists on the year, while John Joseph (Longmeadow, MA) and Dave Anderson (East Greenwich, RI) tallied 22 and 17 goals, respectively.

WPI placed five members on the Pilgrim League all-star team, including Zagrany, Dave Sheehan (Wilmette, IL), Chris Clausson (Wayland, MA), Dave Collette (Leominster, MA) and Bill Simpson (Needham, MA).

The men's tennis team also had a fine season, snapping a 13-year losing skein with a 5–3 record. WPI was led by number-one singles Dan Mott (Holden, MA). He had a sparkling 6–2 record and at one point during the campaign was 5–0. Number three, Carlo Gretter (Venezuela), and number four, John Scacciotti (Maynard, MA), played well all season for head coach Alan King. And Eric Reidmiester (Brooklyn, CT) won five consecutive matches to finish 5–1.

In a close 400-meter race, All-New England Economou breaks the tape against MIT's best.

Although the baseball team ended with an 8–19 mark, there were obvious bright spots, including the play of center fielder Chuck Hickey (Ashland, MA), who led the Engineers in seven offensive categories. Meanwhile, impressive freshmen like Dave Scala (Worcester, MA) and Mike Shipulski (Methuen, MA) played with the poise of seasoned veterans. Other stars for WPI were Jack Holzman (Braintree, MA), Dan Coakley (Sterling, MA), and Steve Nolan (Malden, MA). The pitching staff was led by ace righty Bob Hess (Needham, MA). He finished with a 5–4 record, an enviable 2.81 earned run average, and the only shutout of the season.

Like the diamondmen, the women's softball squad had fine individual performances despite its 6–7 record. Pitcher Michelle Bugbee (Holliston, MA) won all six games and ended with an impressive 3.39 earned run average. Hitting stars were Chris Clancy (Braintree, MA), Moe McGlone (Middleboro, MA), and Cindy Perkins (Nashua, NH).

The men's golf team suffered through a 2–10 season, but a shining light was the presence of Eric Meerback (Easton, CT), who consistently shot the team low. And the women's club track team showed a 1–4 record, with the lone win coming against Clark. Elaine Santry (Weymouth, MA) and Michelle Payant (Southbridge, MA) excelled for the Engineers.

At the conclusion of the season, student athletic awards were presented at the annual Varsity Awards Banquet. Pete Sifferlen and Chiara Whalen (Brick, NJ) were presented the Varsity Awards for outstanding senior athletes, while Bob Hess received the Percy Carpenter Award for sportsmanship, and Karen Brock (N. Hartland, VT) won the Patricia Graham Award for leadership and sportsmanship. The Leo S. Hansson Award was given to Carlo Gretter as the outstanding sophomore; and the Coaches Awards, to outstanding freshmen, were presented to John Loonie (Brockton, MA), Amilcar Carniero (Framingham, MA) and Cindy Perkins. The Ted Coghlin Managers Award went to Martina Gorski (Webster, MA).

Gene Blaum
Sports Information Director

WPI Wins Two More CASE Awards

It is an unusual year when WPI fails to win at least one Recognition Award from the Council for the Advancement and Support of Education (CASE). In 1983–84, WPI was honored with two of these prestigious prizes, which celebrate special achievement in the fields of institutional development—alumni affairs, public relations, publications and fund raising.

First, for the fifth time in six years, the college has been recognized for excellence in alumni giving with receipt of the coveted CASE-U.S. Steel Foundation Award. This prize acknowledges sustained performance over four years in alumni giving to the annual fund. Over the past 24 years, this program has recognized more than 500 institutions through cash gifts totaling nearly $1 million.

"Five out of six isn't bad," says former Alumni Fund managing director Sharon C. Davis, "especially when only a few colleges can lay claim to a more consistent record. WPI alumni have much to be proud of." Sharon resigned her WPI post June 30 to become director of development of the Bancroft School, Worcester.

WPI congratulates and thanks not only the thousands of alumni whose generous concern for their alma mater has made this sustained performance possible, but certainly Sharon Davis as well. Her leadership has had much to do with the Alumni Fund's success over the past decade.

The second CASE Recognition Award was given to the WPI *Journal*, for improvement in periodicals programs. This award is based on content, writing, editing, visual communication, printing, use of resources, and objectives for improvement.

Son of a gun!

A PASSION FULFILLED, FOR ALL TO ENJOY

WPI's magnificent Higgins House continues to impress us with its enduring qualities of taste and construction. And its history is a tale as colorful as that of the 16th-century Tudor castle that inspired Aldus Higgins, '93, to create a dream house for his wife May.

By Lora Brueck

Of all the inquiries that come to the WPI Archives, more concern WPI's priceless Higgins House than any other aspect of the college history. Questions come from students—some writing Humanities project reports—others from faculty, staff and the public, all satisfying a curiosity about the House: Who was Higgins? When was the estate built? Why a mini-castle tucked away on the edge of the WPI campus? How did the house look in its prime? How has the house been used, and what is its future?

Some of the answers to these questions can be found in the artifacts of the WPI Archives; but many are built into Higgins House itself—in the sneers of the gargoyles, in the ancient wood paneling, in the fluted chimneys and antique tile.

Most of us stand in awe of the Higgins House—that a WPI graduate lived in such grandeur; that a mere 60 years ago construction of this magnificence was economically possible; that such time, care and attention to detail were invested in a house.

Overleaf: In 1925, the "new" Higgins House was one of Worcester's choicest properties. Clockwise from top left: Aldous C. Higgins '93, in 1940; gables show a recurring pattern: anchor and porpoise entwined; details from the garden; the elegant Great Hall.

The story of Higgins House goes back to the 1865 founding of WPI itself, known then as the Worcester County Free Institute of Industrial Science. The school combined the dreams—and financial resources—of two local industrialists, John Boynton and Ichabod Washburn, to train young men as engineers. Boynton's Institute gave them the classroom knowledge and Washburn's Shops the hands-on experience.

Milton Prince Higgins had grown up on a Standish, Maine, farm, where, as a boy, he tinkered in his father's copper shop. After receiving all the education available in Standish, he went to Manchester, New Hampshire, to work in the Amoskeag Mills. Higgins came to Worcester in 1868, as the first superintendent of the Washburn Shops. A recent graduate of Dartmouth College's Chandler Scientific School, he came highly recommended to Ichabod Washburn by his Dartmouth professor, John Woodman, for whom Higgins would name his second son.

When Higgins arrived in Worcester, he already had plans to marry Katherine Chapin, but first he needed to pay off his college debts and save a little nest egg. They were married in 1870 and moved into a boardinghouse on Boynton Street, where most of the school's faculty lived. Soon, Milton and Kitty were able to purchase her dream of a house, at the corner of Bliss (now West) and Salisbury streets, the present site of Goddard Hall. It was here that Aldus Chapin Higgins, the first of four Higgins children, was born in 1872.

The Higgins children were a familiar sight on the Tech campus, and it was only natural that Aldus and John should be educated here. Aldus graduated in 1893, and John in 1896. The yearbook of the class of 1893, the *Aftermath*, shows Aldus's popularity among his classmates: "'Allie' is a striking refutation of the doctrine that no good thing can be connected with the faculty. Be it said to his credit that no confidence of his classmates was ever betrayed by him."

Aldus left Worcester for law school at Washington's National University. In 1898, he married a Washington, D.C., woman and graduate of Vassar College, Edgenie Brosius. Back in Worcester, Milton Higgins bought the triple-decker next door, at 218 West Street, for his son, and Aldus and Genie moved in.

At about this time, the propriety of an educational institution carrying on a commercially successful business—the Washburn Shops—became increasingly controversial. The WPI trustees decided to discontinue the business of the Shops, retaining but a small teaching role for it. Milton Higgins was asked to resign. With his friend, WPI mechanical engineering professor George Alden, the two left to continue the hydraulic elevator business they had started in the Washburn Shops.

At about that time, Milton Higgins became a partner in the Norton Company, with its new grinding-wheel business. By the time the Higgins House was being planned in the early 1920s, many changes had taken place in Aldus Higgins' life. His beloved wife Edgenie Brosius had died suddenly in 1911 at the age of 39, leaving him with two children, Elizabeth, 11, and Milton, 9. He continued living at 218 West Street, next door to his childhood home, and in 1914 married a Worcester woman, Mary Sprague Green, known as "May."

Soon after their marriage, Aldus bought a dozen acres behind the Higgins' homes on West Street, then a barren field, from the heirs of Harrison Bliss and the Worces-

Michael Carroll

Michael Carroll

ter Art Museum, who had been donated the land by Stephen Salisbury. Here Aldus and May planned their dream house.

Aldus had risen through various positions at Norton to become treasurer of the company. In 1914, his invention of the water-cooled furnace won him prestige worldwide. His work frequently took him to Europe, where his interest in art grew. He loved the old English castles with their turrets and moats. One in particular, Compton Wyngates, struck his fancy. To duplicate it in Worcester, in miniature, on the land where he had lived most of his life, became his passion.

Compton Wyngates, located in central England, in Warwickshire, was built in about 1525, after fortified castles were out of date, but it retained many of their features—a moat, secret hiding places, multiple stairways, and towers with crenated battlements. It had 80 rooms and 17 flights of stairs. In the 1790s it was ordered destroyed by the destitute Lord Northampton, but a servant saved it from ruin. All but 30 of its 275 windows were bricked over to avoid paying the window tax.

Some of the external features of Compton Wyngates are replicated in Higgins House: the multiplicity of ornamental brick chimneys, all different from one another; the half-timbered gables; the variety of building materials—brick, stone, wood and stucco.

Both homes combine many styles, perhaps because both used materials from other buildings. Aldus Higgins brought in pieces from around New England and from Europe, blending antique and contemporary, local and foreign, to create a patchwork quilt of a house.

The blueprints of the estate, now located in the WPI Archives, are works of art in themselves. They show the time and care put into planning the estate by many architects, who worked closely with Higgins, making revisions according to his specifications. The plans cover the minute details of the house and grounds—window frames, mantels, brackets, lighting fixtures, ironwork, and placement of greenery.

Construction was begun in 1920, halted for a year due to financial recession, and "completed" in 1923. The plans, however, show that Higgins was never really finished with his dream house, constantly remodeling and adding details.

The Higgins House can be appreciated on two levels—the overall, wide-angle view and the close-up. Upon visiting the estate for the first time, one is impressed with the grand scope of the buildings and grounds.

On the exterior, the heavy stonework of the octagonal tower, and the vertical lines of the five chimneys and exposed beams give the feeling of great size. Shielding the house from the outside world, massive oaks—older than the house—and tall pines add to the magnitude.

Inside, beginning with the Great Hall, the number (29) and dimensions of the rooms continue the impression of size. The Great Hall alone measures 36 by 22 feet, with a 36-foot-high pitched wooden board and beam ceiling. At one end, a three-story arched window overlooks large expanses of lawn and magnificent formal gardens. Opposite it, the balcony and organ loft rise high over the main floor. The fireplace, with its mantel carved from

a roof section of an Italian monastery, is large enough to burn a six-foot length of timber.

However, it is the attention to detail, the personal touches, added by Aldus and May Higgins, that give the House its appeal—that make you notice something new each time you visit the estate.

On the outside, the five chimneys, all different, exhibit this detail. Their brickwork is in spiral, octagonal and diamond patterns. The central chimney, made of three sections, is protected with a peaked copper hood supported by ornamental ironwork.

On the east side, the brick is laid up between exposed beams in a diagonal pattern, with only the ends exposed in the form of flowers. About ten kinds of brick were used in the construction, but care was taken that they be laid five or six of a kind together before shifting to another type.

A recurring design throughout the house, inside and out, is the anchor with a porpoise intertwined around the shaft. This anchor and porpoise, with the name "Aldus," was the imprint of the 16th-century Venetian printer Aldus Manutius, revered even today for the quality of his work. The anchor symbolizes strength and stability; the porpoise speed and activity. Although Higgins may have chosen this symbol because it bore his name, certainly its meaning is appropriate to his creation—his house.

The anchor and porpoise motif can be seen on approaching the house in a large crest on the outside of the tower wall. Inside the entrance hall, the bricks in the wall and flagstone on the floor are interspersed with decorative tiles, flowers, ships, birds and, again, the anchor and porpoise. The stucco gables on the exterior of the East Wing are imprinted with anchors, porpoises, and May Higgins' symbol, the rose.

Higgins brought iron hinges from England, and designed ornamental ironwork which a Swedish craftsman took two years to complete. On the face of the Great Hall balcony, Higgins installed hand-carved and -painted panels representing the coats of arms of all owners of the land, from the Indians to the Higginses. No detail, it would seem, went unattended.

In contrast to the dark and heavy atmosphere of the main rooms is Mrs. Higgins' suite (now used for visiting VIPs), consisting of a boudoir (sitting room), dressing room and bedroom. This area was redecorated in 1931. The walls of the boudoir are of light wood in panels topped with elegant arches and carved flowers. The floor

Marvin Richmond

The boudoir in Mrs. Higgins' suite, now reserved for visiting VIPs.

is parquet. The brown and white marble fireplace and mantel have the same graceful curves as the paneling.

The panel to the right of the fireplace is a concealed closet door. Inside is a window overlooking the Great Hall, through which Mrs. Higgins could view her guests before joining them.

The aeolian organ in the Great Hall, with its three-tiered console, was a source of enjoyment to Aldus Higgins, although he did not play the organ. (It was played with rolls.) The pipes were installed behind the uppermost balcony, the front of which is decorated with an ironwork pattern of a musical score with the words "Pastime with good company I love and shall until I die, grudge who will but none deny, so God be pleased this life will I."

After Aldus' death in 1948, May Higgins felt no need for the organ and donated it to Saint Joseph's Abbey in Spencer. It was removed from Higgins House and installed at the Abbey by the same craftsmen who had originally installed it.

Higgins was an admirer and collector of paintings and stained glass. He traveled in Europe with Henry Taylor, director of the Worcester Art Museum. Higgins was an artist himself, painting mostly landscapes. The house was hung with paintings by Picasso, Braque, Cezanne and Roualt, which Higgins bought in Europe before their value escalated.

The House was a wonderful place for entertaining, and the Higginses would often host parties for their Worcester friends. At one of these parties, guests were not allowed to enter without an original painting done themselves; these paintings were hung in the garage for viewing, and a prize was awarded for the best.

Michael Carroll

Michael Carroll

Michael Carroll

Michael Carroll

Above: Aldus Higgins previewed his art in this gallery (now a storage room).

After Aldus' death, May Higgins continued living in the House until she died in 1970. She had bequeathed the Higgins House to WPI. However, the 15th- and 16th-century stained glass from European churches that adorned all of the larger windows, as well as the paintings, were not included in the bequest. They were sold at auction by Parke-Bernet Galleries, and the proceeds from the sale were used to pay taxes.

When WPI first inherited the estate, it was at odds as to what to do with it. Some suggestions were to move all administrative offices into it, to tear it down, or to use it for a student center, infirmary, or arts and humanities center.

A planning study was done by Charles W. Moore Associates, to offer solutions for the annual $20,000 upkeep and tax bill of the House, coupled with the problem of inadequate student housing on campus. As a result, some areas of the house were rented to students and faculty while other rooms became available for public functions. The main rooms on the first floor—the Great Hall, library, sun room, dining room and kitchen suite—were prepared for use as a function facility by a committee composed of faculty, staff and their spouses.

In the fall of 1971, 22 students, 16 men and 6 women, moved into the upper rooms—the servants quarters, east wing bedrooms and the tower room. They shared household work and undertook maintenance and repair—waxing floors, washing windows, rewiring lighting fixtures, repairing air conditioning and heating systems, and taking care of the grounds. They also set up the main rooms for events and acted as guides.

During the first two years, Higgins House received heavy use. The Spectrum Fine Arts Series was held there; an Intersession course given by Prof. Edward Hayes resulted in the production of Tudor playwright John Heywood's "The Play of the Weather" in the "Higgins Manor." Sets were built in the spacious basement and moved to the Great Hall for the performance. There were weekly buffet lunches for faculty and staff.

Of the original twelve acres of the estate, about five remained when WPI inherited it. As the campus becomes increasingly congested, the open lawns of the estate look inviting for development. Two attempts by the college, in 1971 and 1981, to use a portion of the land for parking lots caused such protest among students and faculty that these changes have been put on hold.

Presently, the main rooms of Higgins House receive almost daily use for Continuing Education programs, reunion functions, luncheons, banquets and weddings. The east-wing bedrooms are used as offices by the Continuing Education seminar staff and by a trustee of the Institute. The former servants' quarters house four students who watch over the house and set up for functions. A faculty member rents the apartment over the garage.

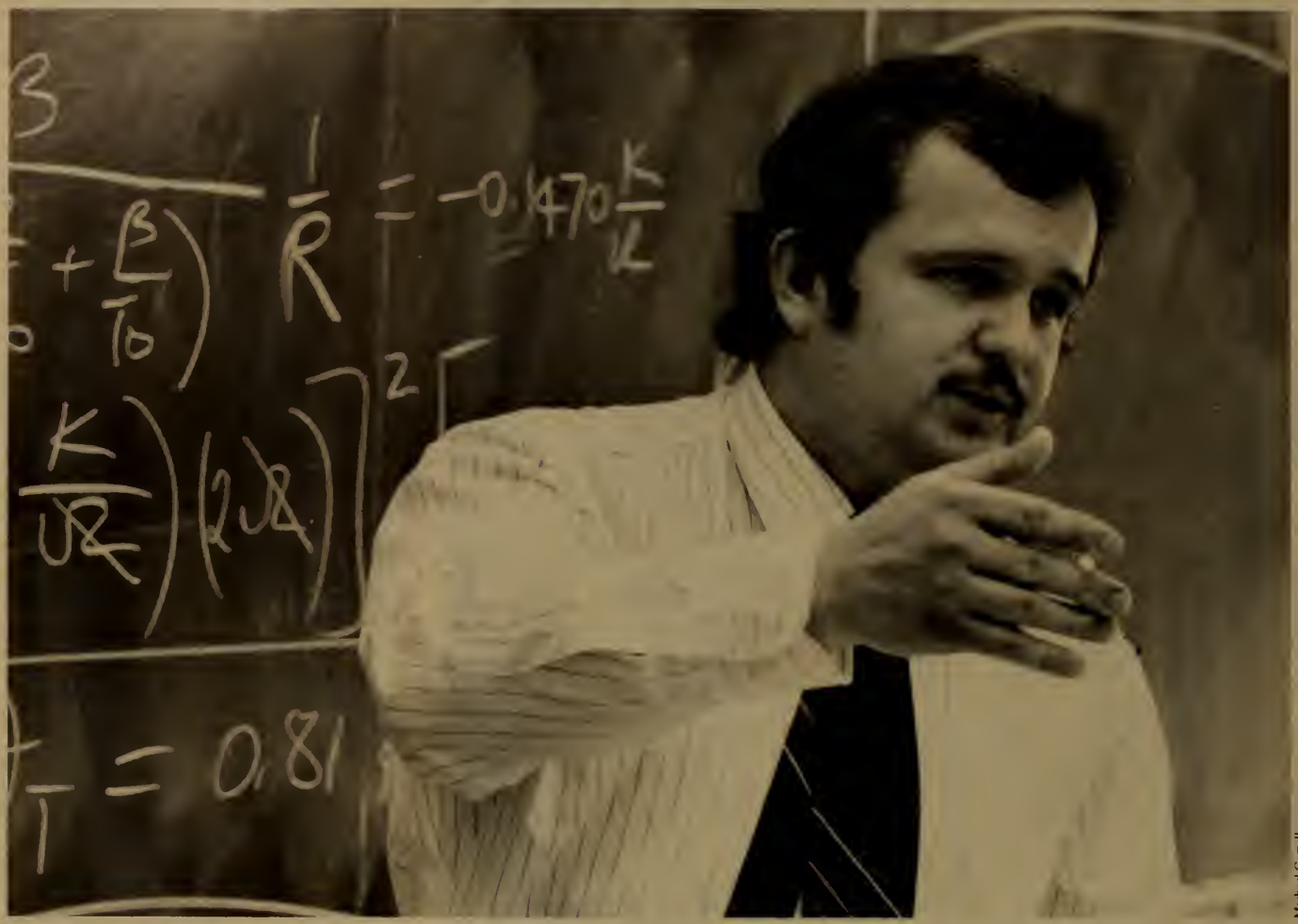
Although it is beneficial for WPI to be able to use the estate in these ways, the heavy use is not without its costs. The beautiful, ornate entrance doors—with the Aldus trademark in wrought iron, leaded windows and wood carvings—lie idle in the basement, having been replaced by more utilitarian models. And some ironwork knobs, latches and decorations have disappeared despite stepped-up security.

The value of Higgins House cannot be quantified. To recreate it today would be impossible, as few craftsmen of the type employed by Higgins still exist. The centuries-old tiles, corbels, beams and stonework could not be replaced, at any price.

On a typical sunny spring day, one can see how the WPI community adores the Higgins estate. In a stroll around the grounds, flowering with azaleas, rhododendrons and magnolias, one will see Frisbee-playing and sunbathing students relaxing from college pressures and staff members eating their lunches in the gardens. Probably without realizing it, they are all grateful that Aldus Higgins dreamed of a castle in Worcester, and that WPI has had the wisdom to preserve it for the pleasure of so many.

Lora Brueck is the WPI Archivist.

Rich Pryputniewicz:



Michael Carroll

A Giant in the Land of Lasers

WPI steps to the forefront as the applications of holography and fiber optics expand.

By Michael Shanley

Rest your arm on the 3,000-lb. steel-topped table in Rich Pryputniewicz's lab and watch as the table sags, then with a hiss quickly readjusts itself.

Custom-built in California, the self-leveling table detects and makes allowances for such nearly imperceptible events as the vibration of Higgins Laboratory itself caused by trucks passing by outside.

Like the rest of the several hundred thousand dollars' worth of equipment in the two labs on the second floor of Higgins, the silver table is a precision instrument. What's happening on top of the table surely demands precision: calculations are being made on objects that can be altered by the weight of a single grain of sand or even a speck of dust.

What's going on in those rooms—where dazzling beams of colored lights bounce off mirrors and snake through tiny glass tunnels—is research into two rapidly advancing technologies: holography and fiber optics.

Six years ago, there were no steel-topped tables in Higgins Labs. There were no tables because there was no Ryszard J. ("Rich") Pryputniewicz. (Pronounced just as it's spelled, Rich likes to say.) Rich built the labs from scratch, getting industry to pay for the equipment in exchange for research.

Before joining the Mechanical Engineering Department in 1978, Rich spent seven years at the University of Connecticut—as a graduate student, a research and teaching assistant and, finally, an assistant professor. That last position was a joint appointment in the School of Engineering and the School of Dental Medicine. In that capacity, he was involved in holographic research that today stands as seminal: the

use of pulsed lasers to make holograms of the mouth, skull and jaw.

"We were working with real people and real teeth," says Rich, "something no one had done before. We were trying to identify the best way of moving teeth with appliances—braces and the like.

"It involved the examination of structural properties, stress and strain on the jaw and the interaction of skull bones—a complex series of measurements. But we were really just trying to answer a simple question: how do teeth move?"

The question couldn't have been answered without holography—a way to take 3-dimensional pictures using light patterns. Holography was discovered in 1947 by Nobel-laureate Dennis Gabor, a Hungarian-born scientist working in London. Gabor was looking for a way to improve the power of the electron microscope (a holography application that, ironically, never quite worked out) when he first proposed a new two-step process of lensless photography. Here's how the process works:

The light beam from a laser is split into two parts. One part illuminates the object. The light scattered by the object interacts with the second part of the beam and that interaction is recorded (photographically) as an interference pattern. This photographic record, or negative, is called a hologram. For the second step of the holography process, the hologram is placed in a light beam that reconstructs the pattern and allows the observer to see the original image in perfect 3-dimensional detail.

Gabor's discovery, which he called holography—from the Greek words "holos," meaning all or whole, and "gramma," meaning message—was for years impractical. That's because the second step in the holography process requires a coherent and monochromatic—or ordered—light source, and no such practical source existed until lasers were developed in the early 1960s.

For the uninitiated, the basics of holography can be difficult to grasp. The hologram itself, for example, is a glass plate. But when you hold it up to ordinary light all you'll see is an unrecognizable series of markings. What you won't see is anything that looks like the object that was photographed. But illuminate the plate with a coherent light source—a laser—and you'll see a perfect image of the object, in all its 3-dimensional glory.

Another tough concept to handle: drop a hologram on the floor so that it smashes into a thousand pieces, and each piece will have the entire image on it. Each piece will contain all the information necessary to reconstruct a complete picture of the object.

To create this double exposure hologram, one exposure was taken of the empty wine glass, another of it filled. The fringe patterns show displacement by the liquid.

Perhaps most fascinating—and, for some, perplexing—is the way a hologram allows you to view the object from different directions. One analogy frequently used is that an illuminated hologram allows an object to be viewed as if through a window—if you move your head to a different part of the window you'll see the object from a different angle.

For scientific and industrial applications, though, more than a pretty 3-dimensional picture is required. What's needed is a picture of how an object *changes*—when it's placed under stress, for example. For that, a second exposure is needed. To help explain the process, let's go back to the dental research Rich and his colleagues were working on.

In order to actually see how teeth move, one exposure is taken of just the teeth. Then a set of braces, for example, are installed, a force is applied and a second exposure is taken. What you'll see now when the hologram is illuminated is a picture of the teeth and jaw with interference or "fringe" patterns that indicate movement or deformation of the teeth and bones. Most of Rich's research, then and now, involves interpreting these "fringes" and translating them into numbers that indicate the degree of displacement or deformation.

This concept of double-exposure holography can be transferred to any other kind of analysis—stress, vibration or heat, for instance. As mentioned before, measurements of astonishing precision can be made: stress on a heavy object caused by sound, wind or even specks of dust. "Holography is capable of measuring displacement on the order of 1 billionth of a meter, strain on the order of 0.2 microstrains," says Rich. "It's especially good for testing tiny components that can't be tested by traditional means. Some people use it for finite element analysis or heat transfer studies—things you can't measure 'by hand.'"

Ask Rich how he got interested in holography and he takes you back many years and across many miles to a suburb of Gdansk, Poland, where he was born and raised.

"I can remember my father buying me a camera when I was very small," he says. "I was taking photographs before I was in the first grade."

Years later, after Rich, his parents and his three brothers had emigrated to the United States and settled in Norwich, CT, he read an article in *Scientific American* about photography by laser.

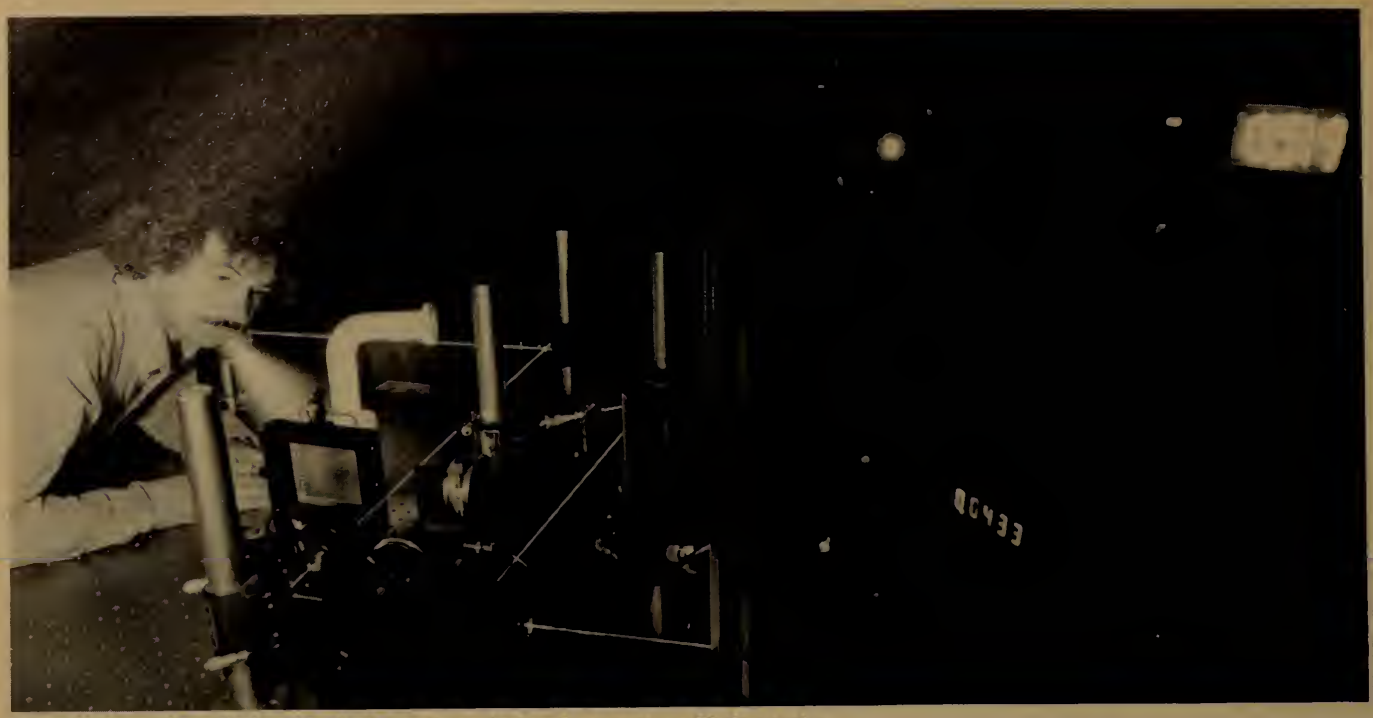
"I started to read on the subject and one thing led to another," says Rich. "At that time, there was just holography with a single exposure—no fringes."

At UConn, Rich met a professor who was also interested in holography, and the two began working together. "It was extremely difficult to record holograms in those days," notes Rich. "The equipment wasn't advanced enough."

As the equipment improved, Rich and his colleagues were in the forefront. They did research on a number of topics, including stress analysis of turbine blades for United Aircraft (now United Technologies).

So it was with a strong background in the use of lasers that Rich came to WPI. When he got here, however, the going was rough for a while. There was virtually no laser research equipment in WPI's Mechanical Engineering Department, and Rich found himself spending endless hours in meetings or doing paperwork in an effort to win research grants. He credits President Edmund T. Cranch, former Dean of Faculty Ray E. Bolz and Mechanical Engineering Department Head Donald N. Zwiep with helping him get through those difficult times.

In hindsight, it was a January 1979 Intersession course that really got things started. During Intersession, a two-week period in January, the WPI community is offered a wide variety of "minicourses"



Michael Carroll

Peter Hefti works with the ultra-high accuracy heterodyne system of holography.

taught by faculty, students, visiting scholars and experts. Interest in Rich's laser holography course was great—70 or so students showed up. Encouraged, Rich integrated the study of lasers into some of his regular courses.

The following year's Intersession, Rich offered another holography course, this time for industry representatives. The response was overwhelming. People—more than he could handle—came from all over the U.S. and Europe. Rich made a number of important contacts at the course. Soon thereafter, grants and equipment began to trickle in. The laser labs began to develop.

The two fully equipped labs as they stand today are testimony to the talent and perseverance of one man. By and large, Rich arranged things so that companies provide him with the equipment he needs, and when the research is done WPI keeps the equipment.

What kind of research, exactly, does Rich do? Good question, but one that can't be answered directly. Virtually all of Rich's work is the proprietary interest of the organizations that fund his research.

In general terms, Rich focuses his research as well as his teaching on the engineering applications of lasers—their use in design optimization studies and fluid flow or in measuring temperature, distance or corrosion. He often works with Prof. Ron Biederman or others from the WPI Materials Engineering group using lasers to determine material properties.

"It's the application of the technology that interests industry," Rich says. "They all want hard numbers, and that we can give them."

The growing number of industries interested in holography now include auto, chemical, food processing, medical, aerospace and shipbuilding, to name a few.

Few companies can afford to do their own holography research—it's just too expensive to equip a lab and support a full-time research crew. For many big firms, however, research money is not a problem. United Technologies, General Electric, General Motors and other industrial giants have major full-time research programs in holography.

Rich has done research for more than a dozen firms, including General Dynamics, Raytheon, Wyman-Gordon, Norton Co., AMP Incorporated and International Harvester.

"For years," says Rich, "few people thought holography would ever be really useful. Now people are starting to come around."

Another burgeoning technology that Rich and his students are studying is fiber optics, which Rich describes as a "pipeline for light."

The fiber is a long, super-thin glass tube that allows light—from a laser, for example—to be transmitted at incredible speeds and with minimal loss. Bursts of laser light are replacing electrical signals as the primary means of telephone communications; optical fibers are replacing old copper wiring. Companies like AT&T, GTE and MCI are installing hundreds of thousands of miles of optical fibers a year. With 300 times the information-carrying capacity of copper wiring, fibers can transmit huge volumes of information: it would take about two seconds to transmit the information in an entire set of encyclopedias.

Glass fibers are also being used to allow doctors to view the inside of the human body and to transmit laser beams for use in surgery. In the factory, fiber optics allow light to be directed through the dirty, dusty atmosphere.

Brian Nason of Saco, Maine, who graduated from WPI in May, will be back this fall to continue the fiber optics work he began as an undergraduate. For his Major Qualifying Project, the ME major studied the use of remote fiber optic sensors for measuring vibrations. He used a cantilever beam as a standard and a loudspeaker to induce the vibration.

"The best thing about it," says Brian, "is that it's non-invasive, non-destructive testing—you don't have to attach anything to the object. And you can measure vibrations as small as one micron, which is one times 10^{-6} meter." Brian hasn't yet defined his graduate topic, but he plans to study a fiber optics application that no one has yet examined.

Another laser lab graduate student is Bob Cruickshank of Scarsdale, NY, who is studying the management of energy sys-

tems. He's using computers in the holography lab to design software programs that would automatically run household machinery—lights, radios, TVs, hot water and heating systems, stoves—anything that consumes energy. The programs would also work for people who want to generate power using alternate forms of energy.

Bob, who hopes to spend six months studying at the University of Sterling, Scotland, this fall, got interested in holography while working as a work-study student and, later, as a teaching assistant in the laser labs. He has spent a lot of time putting together the equipment for laser experiments and has participated in several studies dealing with laser applications.

Ph.D. student Aman Khan of Bangladesh hopes to complete his holography thesis by December. His work involves fundamental research in heterodyne holography, the most exact method known for evaluating fringes. Currently working as an ME instructor, Aman hopes to stay on at WPI. "It's hard to find research facilities that match what we've got here," he says.

Another regular in the labs is Peter Hefti, an opto-electronics specialist from Switzerland who does experimental research for Rich. Peter, who spent eight years working with lasers in Europe, came to WPI two years ago after meeting Rich at a conference in France.

Also doing graduate research are four part-time students working on their master's degrees while holding down jobs in industry. On the undergraduate level, five students will be starting holography or fiber optics projects this fall.

The job outlook for students in these fields is good, says Rich. He often gets calls from companies who want to hire someone who can "handle a laser."

Between overseeing student research, conducting his own research, teaching courses, seeking funding and attending conferences, Rich will have his hands full. But that will be nothing new for this man who says "for me, each day has 25 hours, each week eight days." You'll never catch him standing still. Last year, he toured Australia and New Zealand, lecturing on holography. He frequently travels to symposia or conferences, presenting papers, learning, making contacts. This summer there were conferences in Brazil, Japan and Portugal.

"Conferences get you funding," explains Rich. "There are always industry representatives there. Sometimes it takes a couple of years, but you'll get a phone call saying, 'I remember you made a presentation on such and such. Here's our problem. Is this feasible?' "

Michael Carroll

Brian Nason makes final adjustments to a fiber optics experiment on light transmission.

When he's not teaching a class or rushing off to the airport, you'll most likely find Rich in one of his labs doing research.

"The beauty of research," says the man who has turned down a number of lucrative offers from private industry, "is that you're free to follow whatever path you feel is necessary—you can go with your gut feelings. Always, you're dealing with unknowns, and there are lots of different directions to choose from. Here, I can make the choices. In industry, they make the choices for you."

Despite his hectic schedule, Rich retains a calm, soft-spoken demeanor and an Old World sense of hospitality. Drop by his office and you'll get a warm welcome. You'll be offered coffee and made to feel comfortable. Students who come to his office with questions are treated with respect and addressed as colleagues.

Rich finds time to meet with nearly all those who seek him out. The only ones he has no time for are those who lack commitment. He simply cannot understand people who go through life doing just enough to get by. Not a surprising sentiment, really, from a man who knew not a word of English when he arrived in America but quickly taught himself enough to begin taking college level courses, who wrote a detailed 100-page monograph for a two-week Intersession course, who built two laser labs from scratch.

Rich Pryputniewicz is a man who believes firmly in the possibilities, in the 25-hour day. When it comes to commitment, he sees no middle ground. You're either on the bus or off the bus. In action and word, he urges his students to climb aboard.

Michael Shanley is Director of the WPI News Bureau.

Golf, Tennis, Anyone?

Reunion '84 goes into the archives as the wettest—and one of the happiest—alumni events ever.

Tradition plays a leading role at WPI Reunion Weekends. There's the all-class Reunion Luncheon, the rollicking Old Fashioned Clam Bake, the Reunion Parade, hospitality suites, alumni awards, campus tours, class dinners, fun and games. Lately, some might even add bad weather to this list of traditions. For the second—no, the third—year in a row, we've gotten drenched or drizzled. And if any weather could ruin a get-together of old friends, it would've been the rains and winds of Reunion '84, May 31–June 3.

And yet, few who attended would say it did, we'll bet.

In addition to the traditions of Reunion, golf, tennis, computers, photography, stained glass and the Boston Pops were on the agenda. And even though the rains began on Thursday and poured until Sunday morning, a few hearty souls actually completed 18 holes of golf; others found more favorable tennis conditions at indoor courts.

At the Reunion Luncheon on Saturday, with more than 625 alumni filling Harrington Auditorium, the Class of 1917 Attendance Cup was awarded to the 50th Reunion Class of 1934 for the highest percentage of members attending.

Alumni awards were presented to Robert Fowler, Jr., '36, and C. John Lindegren, '39 (Herbert F. Taylor awards for outstanding service to WPI); John P. Burgarella, '50, Wilfred J. Houde, '59, and David E. Monks, '64 (the Robert H. Goddard Award for professional achievement); and Patricia Graham Flaherty, '75 (the John Boynton Award for outstanding involvement by a young alumnus). Finally, Fr. Peter J. Scanlon was presented the WPI Award for distinguished service to the college by a non-alumnus (see box story, p. 18).

Chester Inman, '14, celebrating his 70th anniversary, was the oldest alumnus attending. Fred Costello, '59, came all the way from Hong Kong; Harvey Rosenfeld, '59, from Holland; and Smil Rueman, '49, from Israel.

A few new features added vitality and variety to Reunion—the golf and tennis tournaments, continental breakfasts and open house at several academic departments, and seminars, like those on photography and computers.

We awoke to a glorious Sunday morning, with eye-opening proof that the sun still shines in Worcester—in spite of the gales of Reunion '84 . . . and '83 . . . and '82.

And as for Reunion '85 . . . Ladies and gentlemen, you may place your bets on the weather.

Jack McManus, Bill Pursell and Stan Sokoloff, all '59.

Open houses, in the EE and, here, ME departments, were a big hit with both alumni and faculty.

Marvin Richmond

Charlie McElroy, '34, receiving the Reunion Class Attendance Cup from Alumni Director Steve Hebert, '66.

Prof. Robert Norton (ME) gives alumni a tour of WPI's heavily used computer facility, the "Apple Lab."

Marvin Richmond

Alex Papianou, '57, leads the singing of the Alma Mater at the conclusion of the Reunion Luncheon.

Marvin Richmond

Six alumni shared a special spotlight at Reunion Weekend: (Seated, L-R) Robert Fowler, '36, Herbert F. Taylor Award winner for distinguished service to WPI; Dr. Edmund T. Cranch; Patricia Graham Flaherty, '75, recipient of the John Boynton Award for outstanding service by a young alumnus; John Burgarella, '50, winner of the Robert Goddard Award for professional achievement. (Standing L–R) Irving James Donahue, Jr., '44, vice chairman, Board of Trustees; Wilfred Houde, '59, winner of the Robert Goddard Award; Harry W. Tenney, '55, Alumni Association president; David E. Monks, '64, Robert Goddard Award winner; and John Lindegren, Jr., '39, Herbert F. Taylor Award winner.

Marvin Richmond

Reunion Luncheon 1984, with 635 in attendance.

Dr. Arthur Burr, '29, who teaches at the University of Texas, compares notes with Jonathan Barnett and Professor Hartley Grandin, both of ME.

On a tour of the campus, a student guide fills alumni and spouses in on what's new.

Marvin Richmond

Dr. Edmund T. Cranch at dedication ceremony of the Class of '44 Carillon in Alden Memorial. The Carillon rang true the entire Reunion Weekend.

To an Unsung Hero

He is a force to be reckoned with. But not just his imposing size or the boom of his voice. There is something about his very presence that says in unquestioning terms that the Rev. Peter J. Scanlon believes in himself and his work.

As Catholic spiritual leader for WPI and Holy Cross, and as Vicar for colleges throughout Worcester, Father Scanlon's name and face are familiar to students of all faiths throughout the area.

Yet, as so many students will tell you, he plays more than a spiritual role on campus. He is a friend and counselor as well—to students leaving the security of family, often for the first time, to those despairing for whatever reason, to anyone who simply wishes to relax and talk. Father Scanlon is accessible.

A native of Worcester, Father Scanlon graduated from St. John's High School in nearby Shrewsbury before attending Holy Cross and later St. Mary's University and Seminary, Baltimore, MD. His first assignment in Southbridge, MA, was followed by work in his home parish, Ascension, Worcester, and later in Rutland, MA, and Immaculate Conception, Worcester. In 1966 his role as chaplain to Catholic students at WPI was expanded when he was appointed Newman Chaplain, working with students at WPI, Becker Junior College and Worcester State. At any one time, he has been involved with up to 12 colleges, as well as serving as chaplain for the Worcester Fire Department and as pastor of Our Lady of Fatima Church, Worcester.

For some students, college can become both the best of times and the worst of times, as academic, career and social pressures take their toll. WPI is fortunate indeed to have committed to the spiritual health of its students a person of Father Scanlon's warmth, compassion and keen awareness of human need.

You can't put a number on his contribution to WPI. But Father Scanlon's work does not go unnoticed, though he'd be the last to turn the spotlight on himself.

So, at Reunion, before many of "his" former students, WPI thought it only fitting to honor Father Peter Scanlon with its WPI Award, given for special service to the college by a non-alumnus. Only five others have been so recognized. Yet even this gesture can be but symbolic of the gratitude and respect that the entire WPI community holds for this large, loving man of uncommon generosity.

Marvin Richmond

The Rev. Peter Scanlon, winner of the WPI Award for distinguished service to the college by a non-alumnus, with his mother, Mrs. Peter Scanlon, and his sister, Peggyann.

Prism of the Sky

Bending sunlight, raindrops
have created a scientific puzzle,
an aesthetic marvel, and a
continuing symbol of
divinity and political might.

RAINBOWS: AN OBSERVER'S GUIDE

Alistair Fraser

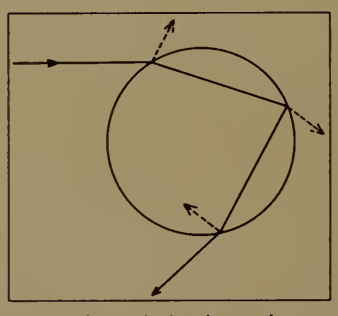
A rainbow is generated by you, the sun, and the raindrops, at the proper relative angles. To begin with, the sun must be directly behind you.

By Raymond Lee, Jr.

Your next rainbow is as close as the nearest garden sprinkler—and as far as the sun. For the rainbow is simply an image of the sun, although a much modified one. Raindrops perform this rearranging of sunlight, and do so by two processes: reflection and refraction.

First, the over-all picture: You can see that the rainbow is part of a circle centered about the shadow of your head. This is true of any rainbow. This circle of light is sunlight reflected by some of the raindrops falling in the distance and it is quite personal: no one else sees the rainbow you see, because no one else is in a position to see the light reflected from the same array of raindrops. But it is not simply reflected. If it were, the sky in the picture above would merely be full of white light.

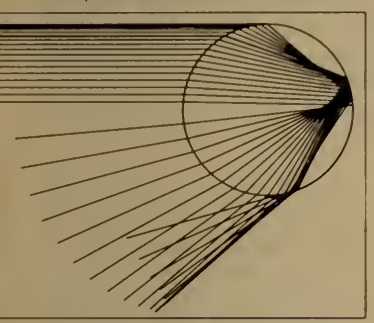
To explain the rainbow, we need to look inside a raindrop. For our purposes, raindrops may be regarded as imperfect one-way mirrors; most light



passes through the drops, but the small fraction forming the rainbow is reflected internally. As sunlight passes from air into the raindrop (or vice versa) it is bent or deviated from its original path, with blue light being deviated more than red. It is reflected from the drop's rear (see diagram), then bent again—refracted—as it passes out. This combination of refraction and reflection occurs at each air-water boundary, and many times within each individual raindrop.

Light emerges from the drop through a range of angles, spraying reflected light over a large part of the sky opposite the sun, and the concentrated

light from many raindrops makes the light bright enough to see. However, it is only light that is refracted on entering the drop, reflected once from its rear, and refracted a second



time on exiting, that forms the main or primary rainbow.

The dispersal of the light displays an elegant geometry, here simplified for clarity. Of course, each drop is penetrated by many rays of light at a time, all over the drop. The sunlight is deviated in many directions, the particular direction depending on both the light's color and where the ray of light enters the raindrop. As shown, a ray which passes through the middle of the drop is deviated by 180 degrees, returning in the same direction it came. But as rays strike the drop at ever more glancing angles, the combined refractions and reflection result in their being bent through smaller and smaller angles.

This process does not continue indefinitely, however. A ray entering at one particular spot will be bent by 138 degrees, the minimum deviation. Rays that enter the drop at more oblique angles are deviated by more than 138 degrees. In contrast to other rays, the minimum deviation ray has a great many neighbors leaving the drop at nearly the same angle. And by nature's alchemy, it is this concentration of light at approximately 138 degrees from the sun which forms the rainbow.

Approached another way, whenever you are illuminated by sunlight, the shadow of your head is 180 degrees from the sun. This makes the bow a 42-degree circle (180 − 138 = 42) centered about the shadow of your head. All rays other than the minimum deviation (or rainbow) ray simply add to the general brightness within this 42-degree circle, which explains why the sky is generally brighter within the rainbow arc.

Why do rainbows come and go so fast? and why do you sometimes see only parts of the rainbow?

It is the combined effect of many drops that gives rise to the bow, and all of them must be at the same angle to the sun with respect to you. Thus, at any instant, only those drops before you which are on a 42-degree circle centered about the shadow of your head can send the concentrated rainbow light to you. These drops may be at any distance from you—your garden sprinkler will do—but must be on the 42-degree circle.

Since the raindrops are falling, there has to be an uninterrupted supply of them for the bow to last longer than an instant. But the edge of a shaft of rain can pass quite quickly across the position where a rainbow might occur, so the bow can appear or disappear just as fast. Or a cloud might block and unblock the sun, bringing the rainbow in and out with its source of light.

Similarly, if any part of the circle where the rainbow can occur is devoid of either drops or sunlight, then that part of the bow will not form. This accounts for the partial bows we often see.

Whether the drops are in the sprinkler spray or in a distant shower, the rainbow is merely sunlight. So chasing the rainbow is as futile as chasing the sun. In fact, moving in any direction is equally fruitless. There is no point in backing up to photograph the whole bow; it won't change size. Rather, it will seem to follow you.

The rainbow's colors arise from the fact that the minimum deviation ray is at a slightly different position for each color, because each color of light can only be bent so far, depending on the color. (The color separation that light undergoes as it is refracted in a prism is an imperfect analogy, but illustrates the process.) Consider red and blue as the colors that bound the rainbow: because blue light at minimum deviation is bent through a greater angle than red light, the red light is closer to the sun. Therefore, red will be on the outside of the primary bow, closest to the sun, and blue will

Alistair B. Fraser

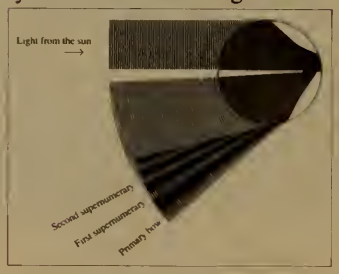
Alistair B. Fraser

be toward the inside.(Red rainbows occur at sunset, as above, because the sunlight itself is red.)

Although an indefinite number of colors is possible, their sequence across the primary bow is invariant. From the outside to the inside of the primary bow the hierarchy is: red, orange, yellow, green, blue, purple. But even casual observation shows that not all these colors may be evident in any given rainbow, and in fact colors may vary along a single bow. But the order does not vary. If the bow displays only orange, yellow, and blue, they will be in that order.

To explain this fact—one apparently unknown to advertising agencies—let us look at light as a wave phenomenon, recalling that waves have a highly salient property: they can interfere with each other. In fact, light waves can interfere in somewhat the same way as water waves. If you drop two stones into a pool, the expanding rings of waves will intersect. Where the wave crests coincide, they reinforce each other to produce a larger wave than either of the originals. On the other hand, where a wave crest of one ring is combined with a trough from the other, the perturbations cancel out and the water is at its undisturbed level.

Although light waves are electromagnetic, not mechanical, and though they oscillate much faster than water waves, on the scale of raindrops the interference analogy holds. Cancellation of light yields darkness, and reinforcement yields more intense light than



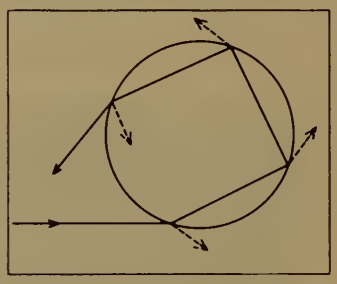
in the original source.

If a raindrop reflects and refracts an advancing front of light waves, much as a curved beach affects water waves, the front folds over on itself, as shown. A dark and bright pattern of interference results, and the first bright band is the primary rainbow. Other bands account for the pastel supernumerary bows sometimes seen within the primary bow, as well as for the dark bands between all these arcs.

Further, the spacing and width of these interference bows depends on the size of the raindrops. As a result, the range of drop sizes in a shower partly determines the intensity of rainbow colors. Generally, the bigger the raindrops, the brighter the rainbow. The smaller the drops—as in a fog—the whiter the bow.

The secondary rainbow, a fainter arc outside the primary, is noticeable for the fact that its color order is reversed with respect to the main bow: the red is inside, facing the main bow, while the blue is outside. The reason is that, in comparison to the primary rainbow ray, the rainbow ray of the secondary has entered a different drop, and sunlight has been internally reflected twice, not once. (See diagram, which uses ray theory for convenience.)

Consider what happens if light is reflected a second time within a drop: the light is canted further upward, and another minimum deviation



results, this one at about 231 degrees. And since each reflection is accompanied by a refraction, every internal reflection means a loss of sunlight out of the drop. (In fact, at each bounce, 94 percent of the ray's energy is refracted out of the drop.) Because the secondary rainbow has two internal reflections, then, it will be less intense than the primary, which has only one.

The color reversal in the secondary occurs because of the larger minimum deviation: sunlight is turned through more than 180 degrees. To get a feel for this concept, pretend that the sun is setting, so that the center of the rainbows is on the opposite horizon. Now imagine that you're holding a pointer aimed behind you at the sun. You rotate it down toward the ground, continue up to point at the opposite horizon, and finally rotate it up further until it forms an angle of 51 degrees with the earth (180 + 51 = 231).

This rotation of the pointer mimics that of the rainbow ray and indicates the position of the secondary bow's red arc. Since blue is always deviated more in the rainbow ray than red, if the pointer rotates upward about 3 degrees more, it will mark the location of the blue arc. This exercise shows us the color boundaries of the secondary: red on the inside, blue toward the outside.

There is only a small separation (9 degrees) between the minimum deviation rays of the double rainbow, but the separation is definite. In comparison to the light-filled areas on either side, this narrow arc between the bows is often noticeably darker, because drops here can send forth no light.

We can demonstrate (and often observe) that the interior of the primary bow is brighter than the background. But the distinction may not be visible, because of a background whose brightness is not uniform, a sun partially obscured by clouds or haze, or a thin shaft of rain. In each case, the low brightness of the primary bow means that only the rainbow's pattern of colors, not its inherent brightness, will be noticeable. For the secondary and supernumerary bows, even the colored patterns will be invisible if the contrast between them and their backgrounds is low. And since

Alistair B. Fraser

these bows tend to be dim, even in the best circumstances their colors appear quite pastel. This explains why secondary and supernumerary bows, though they are always there, are less often seen.

Even the primary bow cannot be seen if the sun is much higher than 42 degrees above the horizon (assuming the horizon is dead level). To see why, imagine that a circle the size of the primary bow is centered about the shadow of your head. When the sun is higher than 42 degrees, no part of this circle is above the horizon, which means there are no raindrops that can send light to you at the rainbow angle. Of course, all sunlit drops are still refracting and reflecting light, and some of that light is being bent at the minimum deviation angle. But now all this light passes above your head.

Of course, you don't have to have a level horizon to see a rainbow. Our ubiquitous water sprinkler would generate a rainbow at the bottom of the Grand Canyon if the spray were sunlit. Conversely, if the horizon falls away below you, then a more than semicircular rainbow may be visible. In fact, from a plane or a very steep hill, it is even possible to see the entire rainbow circle.

Rainbows are most often seen in summer, because the necessary mix of rain and broken cloudiness is more common in summer. Even the lower sun altitudes in winter do not compensate for these reduced opportunities for rainbow watchers.

At any time of year, however, you may be surprised at how often rainbows can be seen, and at their variety. The rainbow may appear with shimmering iridescence near the horizon. Or it may look like a gauzy veil draped across the upper reaches of the sky. But the rainbow is more ethereal than any veil—it has no substance, it is sheerest light.

Raymond Lee, Jr., a graduate student in meteorology at Pennsylvania State University, is writing a book about rainbows with his adviser, Alistair B. Fraser.

Alistair B. Fraser

Ed Thorsett

If you can't wait for a storm, try stalking a rainbow in the misty atmosphere surrounding a waterfall.

Photographing Tips

(1) Do not believe your light meter, which will be fooled by the diffused and scattered light. In order to make the rainbow colors more saturated, you have to underexpose slightly. Generally, one half to one full f-stop will work. Your eye is much more sensitive to those colors than the film is.

(2) Bracket your shot. Make several exposures on either side of the chosen f-stop.

(3) You'll generally get the best results if the storm is in front of you, so that it creates a dark background. The darker the clouds, the better the contrast and the brighter the rainbow.

(4) Cloudy skies tend to make color film go bluish, so that any landscape in the foreground will go off-color. A skylight filter is a faint, rosy-tinted filter that helps screen out some of that excessive blue, and it will help.

(5) Some people recommend a haze filter or a UV filter, but I have never noticed any great effect with either one. A polarizing filter is actually bad, as it can reduce the rainbow, or even make it vanish.

(6) People tend to be so impressed by a rainbow, that they feel just capturing the rainbow on film will produce a beautiful picture. Then when they get the picture back they're often disappointed. I think some kind of foreground interest helps immensely, because it makes the rainbow one element—though it may be the major element—in the total composition. If you shoot just the rainbow, it may very well come out looking like nothing more than a lens flare. The rainbow needs contrast with something in the real world to look its ethereal best.

(7) Shoot quickly. When the ideal condition goes, the rainbow goes, and there's no warning.

—Ed Thorsett

GOD, THE RAINBOW, AND THE ARTIST

In Judeo-Christian culture, artists have tended to ignore the natural rainbow in favor of the mythological one.

©Saskia, Ltd.

Albrecht Dürer's* Adoration of the Trinity *(1511, Kunsthistorisches Museum, Vienna) shows the rainbow used as sheer convention, as a straightforward sign of divinity. Both God and Christ are supported by the rainbow, a rainbow so solid that their garments fold over it. This carpentered bow bears scant resemblance to natural rainbows.

The rainbow as symbol of divinity was hardly new with Christianity. In Greek myth, the goddess Iris travelled the rainbow as Zeus's messenger, meddling in human affairs and often bringing portents of war and death.

HBO Art History Department

In* Last Judgment *(1473, Muzeum Narodowe, Gdansk) Hans Memling depicts the rainbow of Revelation 4:3, with Christ as Judge of the World. Below, the Archangel Michael weighs the souls of men as they are stripped naked for judgment. There were hundreds of paintings of this subject, intended to frighten sinners into repenting before it was too late.

Memling's rainbow is moderately realistic. He clearly knew the rainbow was a circle (in itself an emblem of divine perfection), and he even includes what may be a supernumerary bow. The colors he paints are possible. The rainbow's relation to the illumination is not, however; nor is the way that it swoops forward from a base at the distant horizon.

Research by Raymond Lee, Jr. and Alistair B. Fraser

Tate Gallery, Publications Department

Several centuries later, William Blake's **Four and Twenty Elders casting their crowns before the divine throne** *(c. 1805, Tate Gallery, London) also draws on* **Revelation.** *Surrounding Christ's throne are 24 elders of the angelic court that will sit with Christ in judgment.*

Notice the rainbow—a double rainbow, even. In other drawings, Blake paints the rainbow's colors in plausible order. But here, the colors are backward, Why are they wrong in this instance? Possibly he painted them so on purpose, as part of his intellectual feud with Newton, who had experimentally determined the color order in the rainbow. Blake saw Newton as a man of science and scientific law, as opposed to himself, a man of spirit. In a letter to a friend, Blake writes, ". . . may God us keep/from single vision and Newton's sleep."

National Gallery, London

In John Constable's **Salisbury Cathedral from the Meadows** *(1831, Private Collection, currently on exhibit at the National Gallery in London), the rainbow embraces Salisbury Cathedral. Constable prided himself on his observation of nature and was an exacting cloud painter; he had also studied rainbows. But this bow has subtle faults: the inside darkness is possible but unlikely; the shadows should point to the bow's center; and the sun's altitude is wrong. The storm threatening the cathedral may symbolize the turbulent church politics of Constable's day. Arching above the cathedral, the rainbow hints of hope and divine protection.*

Birmingham Museum of Fine Arts

"My heart leaps up when I behold/ A rainbow in the sky". Those were the words of William Wordsworth in 1802, a time when divinity and nature were linked in poetry and art. In John E. Millais's **The Blind Girl** *(1856, City Museum, Birmingham, England), the little girl obviously sees the rainbow, while her companion obviously* **feels** *it. It is as if the rainbow (a double one) is giving the blind girl spiritual food—and in the background we see ravens, in Christian art a symbol of God's providence (an allusion to the ravens which fed Elijah).*

Architect of the Capitol

Constantino Brumidi's **The Apotheosis of George Washington** *(1865), on the Rotunda dome in the U.S. Capitol, descends directly from medieval and Renaissance* **Last Judgment** *paintings such as Memling's. George Washington, looking faintly queasy about his deification, rides the rainbow, apparently passing judgment. Below, Lady Liberty scourging the enemies of freedom.*

The Fotomas Index, London

In what has come to be called **The Rainbow Portrait** *(attributed to Isaac Oliver, c. 1600, Private Collection, The Marquess of Salisbury), the rainbow becomes a divine talisman, in the hand of Queen Elizabeth I. The meaning would be clear to her contemporaries: Because she holds the rainbow, she has been divinely vouchsafed the right to rule. Indeed, the motto (barely visible) says, "No rainbow without the sun." That is a perfectly satisfactory statement of meteorological fact, but also a statement that the right to rule comes from Christ (the sun).*

Christopher Vaucher

Even without political and religious motives, it's not easy to get the rainbow right, as witness Eric Sloan's **Weather Mural** *(1976) at the Air and Space Museum in Washington, D.C. Sloan specializes in meteorological illustration yet, like many before him, gets it wrong. Any rainbow is sheer sunlight, and all sunbeams and all shadows point to the center of the rainbow, like spokes on the wheel. Sloan's sunbeams, however, slant away from the center of the bow.*

Over the centuries, the rainbow has emblemized beauty, peace, a link between Earth and heaven, a link between now and eternity. And being such a powerful symbolic device, it is naturally used to huckster. In any given shopping day the alert observer, or the not so alert observer, can see a hundred commercial rainbows—and most will have oddly mixed colors. Short of the sun itself, the rainbow has been exploited commercially with more visual nonchalance than almost any non-living object. Witness: There are more than 100 Rainbow Motels and Hotels in the U.S. and Canada, more than 200 Rainbow Bar and Grills. Cigarette ads. Follow the rainbow of CBS Sports. Jesse Jackson's "Rainbow Coalition." You'll find dozens of rainbows in any bookstore. The Hewlett Packard **HP45** *graphics computer is portrayed as the pot of gold at the end of the rainbow.*

The irony is, as the Observer's Guide explains, that the rainbow flees when pursued. It is unattainable. The commercial artists get even the symbolism wrong.

Alistair B Fraser

Alistair B Fraser

Alistair B Fraser

Hewlett Packard

Alistair B Fraser

What's at the end of the rainbow puzzle?

The rainbow has always inspired awe and puzzlement, sometimes joy and worship. But just as often, the bow has been seen as a harbinger of doom. For the Norse, the rainbow was Bifröst, the bridge between heaven and earth. Bifröst was built by the Norse gods for their daily travels to earth, where they sat in judgment of men. When Bifröst is stormed and collapses in the climactic battle with the gods' enemies, it signals the twilight of the gods—and of men.

This fantastic quality colored early scientific study of the rainbow. For example, the Indian astronomer Varahamihira (fl. ca. 550 A.D.) could explain, presumably without qualms, that the rainbow is due both to variegated rays from the sun and to "the exhalations of serpents."

Early Greek science was also tinged with myth, but in the sixth century B.C., the Ionian scientist Anaximenes correctly pointed out that sunlight forms the rainbow. Yet he incorrectly asserted that the light reaches an observer because the rays strike an impenetrable cloud and return to the eye. Because rainbows are often seen against clouds, some version of this seemed plausible. So the notion of the reflecting cloud would persist for centuries, in the face of better explanations.

From Aristotle (384–322 B.C.) came antiquity's most extensive treatise on the rainbow, the authority of which continued largely unshaken into the 17th century. As a champion of common sense, Aristotle claimed that real objects and phenomena, not fantasies, stimulate our senses.

This common sense approach led him—correctly—to agree with Anaximenes that sunlight forms the rainbow. But it also made him propose—incorrectly—that the bow was reflected from a monolithic cloud. He also theorized that the bow lies at a particular distance from the eye. This erroneous but influential notion may have made it seem, over the centuries, that the rainbow was a physical object.

Equally plausible, yet equally faulty, was Aristotle's contention that there are two kinds of mirrors—large ones that reflect forms, and invisibly small ones that can cause colors. The surface of a cloud, he thought, reflects a rainbow because it consists of minute mirrors.

***The title page from a 1512 commentary on a reworking of Aristotle's* Meteorology.**

Aristotle, Descartes, and Newton—among many others—tried to unravel the rainbow's secrets.

This notion, combined with his own rather murky color theory, led to the conclusion that the varying mixtures of darkness and light from the mirrors resulted in a rainbow of red, green, and violet. This tricolor rainbow became a staple of later literature and art.

After Aristotle's death, most rainbow theory consisted of reaction to his work, not all of it uncritical repetition. Among Roman writers, Seneca the Younger (3 B.C.–65 A.D.) correctly noted that the rainbow has an indefinite number of colors, not just three. However, he disagreed with some people's idea that raindrops, not a monolithic cloud, cause the bow.

Eleventh-century Islamic writers familiar with the ancient texts made important contributions. Among these writers was Alhazen (ca. 965–1039), who investigated optics and refraction in some detail. Still, he followed the Aristotelian insistence that only reflection gives rise to the rainbow. He also explained its colors with a theory similar to Aristotle's. While Alhazen did not advance rainbow theory directly, his quantitative, experimental approach to optics would later bear fruit.

European rainbow theory advanced rapidly in the 12th and 13th centuries, partly because Latin translations of Aristotle were now widely available and partly through the founding of major universities. Often sanctuaries for practitioners of unoriginal scholasticism, the universities also produced some quite original thinkers.

Among them was the Englishman Robert Grosseteste (ca. 1175–1253). Citing tests the observer might make, he was the first to state unequivocally that refraction is crucial to understanding the rainbow. However, his abandonment of Aristotle was wholesale, and he seemed ambivalent about reflection's role in rainbows. The result was a faulty geometry for the bow. On balance, however, his use of refraction and observation were vital.

Still unresolved was the precise role that rain or cloud droplets play in the rainbow. Whether they act as a continuum or as discrete transparent globes was variously fretted over and ignored.

Then Theodoric of Freibourg (d. ca. 1310) published a voluminous tract on the rainbow which seemingly answered this vexing question—and which was the first to rely on measurements from laboratory experiments. Like others before, Theodoric illuminated a hollow glass sphere filled with water and produced a spectrum; unlike anyone else, he concluded that the globe's optical properties are much like those of a raindrop. The rainbow, he said, results from the combined effect of individual drops in a shower.

Although Theodoric acknowledged that Aristotle's work had some worth, he rejected the latter's theory of a continuous, reflecting cloud, for "according to the same Philosopher, . . . one never should

depart from that which is evident from the senses." Theodoric correctly perceived both refraction and reflection within the drop, and illustrated their combined effect with lucid diagrams. He even attempted to explain the double rainbow, with results almost as satisfying. But definitive explanations of why the bows are arcs and why they have a nearly fixed angular size eluded him. In the end, he invoked time-honored Aristotelian explanations to solve his difficulties.

In the following three centuries, the rainbow problem was quite popular, and Aristotelian ideas were energetically reworked by scores of scholiasts. At the same time, there was a growing restiveness with Aristotle's ideas—though Theodoric's pioneering work was infrequently cited.

Finally, in 1637, there came a clear and complete break with ancient notions about the rainbow, when René Descartes (1596–1650) proposed a new scientific methodology, offering his research on the rainbow as an example of this new approach. (Analytic geometry was another example.) Apparently unknowingly, he had repeated Theodoric's experiment, reaching the same conclusions about the refraction and reflection of light passing through a drop.

But unlike Theodoric, Descartes had techniques that allowed him to evaluate refraction quantitatively. Using these techniques, he was the first person to know (in a quantitative sense) how light is bent as it passes through a raindrop, and he showed that it is bent through some minimum angle. Theodoric could draw diagrams of the phenomenon; Descartes could attach numbers to it. Thus he could answer the persistent question of why the bow is a circular arc of light at a fixed angular distance from the sun. But then, determined to press for a full solution, he confidently offered a flawed explanation of the rainbow's colors.

Descartes was justifiably proud of his accomplishment, but contemporary reaction ranged from slights to indifference. He had committed scholastic heresy, by abandoning Aristotle. Still, during the balance of the 17th century, several European scientists extended and refined his solutions, and at last a satisfactory explanation for the rainbow's colors emerged. In 1666, Isaac Newton (1642–1727) performed experiments with prisms that were to revolutionize scientific thinking about color.

But his eagerly proffered outline of the work was rejected by several prominent scientists. Newton was stung, despairing to a friend that he had given up "so substantial a blessing as my quiet, to run after a shadow." Prudently, he delayed publication of details for 38 years (until 1704), by which time he had a a different, if not less hostile, audience. Eventually the rigor and repeatability of the Newtonian and Cartesian experiments gave both respectability, and no one took serious issue with them again until the early 19th century.

Now that the primary rainbow seemed well enough explained, attention shifted to more exotic bows. Speculation grew about higher-order bows (caused by multiple reflections within the raindrop). Reports of unusual varieties of rainbows—those reflected in water, seen in dew, or the nearly colorless ones seen in fog—increased dramatically. Even more disconcerting were the increasingly frequent reports of several narrow, pallid bows framed by the primary arc. Such rainbows had been known for centuries, but the main bows had seemed more important. Newton's theory could not account for supernumerary bows at all.

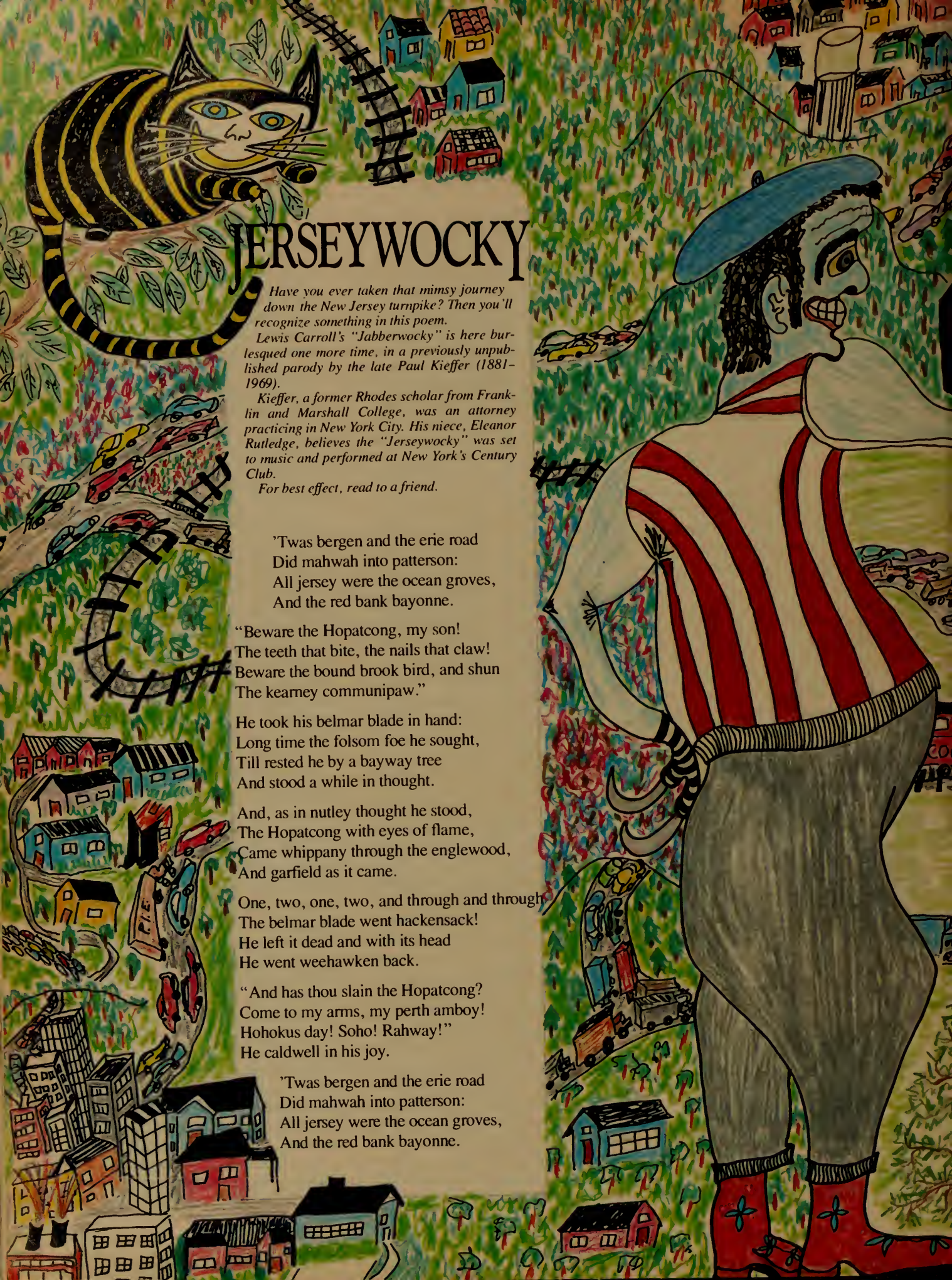
The man who partially resolved the new quandary was Thomas Young (1773–1829), and his solution required a reconsideration of the nature of light itself. After Newton, prevailing opinion in the 18th century held that light consisted of mobile infinitesimal corpuscles. But Young approached the phenomenon as wave motion, analogous to water waves. With this theory, he could explain not only the main rainbows, but also a number of puzzling optical phenomena, including supernumerary and fog bows: The waves of light interfere with one another inside the raindrop, rather like the interfering wakes of boats. Moreover, Young's investigations of color perception helped inaugurate the quantitative study of rainbow colors.

In the opening decades of the 19th century, Thomas Young's rainbow theory won acceptance only gradually, but it did underlie the important work of a fellow Briton, George Airy (1801–1892). Airy extended Young's interference theory with newly developed mathematical techniques, accounting for almost all rainbow features and even explaining small variations in the angular sizes of rainbows, formerly baffling. Because the theory also made clear the approximate nature of earlier work, it met with some resistance from doctrinaire Cartesians, which subsided as experimenters found close agreement between Airy's predictions and careful measurements. Nonetheless, Airy's theory is itself only an approximation, and later 19th-century investigators pursued refinements and alternatives.

In the 20th century, optics has offered increasingly abstruse physical explanations for the rainbow. However, the physiology of vision and the psychology of perception are also key to perceptions of the natural bow, and are outside the realm of most physical theories. Physical theories may explain the intensity of rainbow light, but details of its perception remain in question.

Equally important, nature's experiments with rainbows are not so carefully controlled as those in laboratories. Twentieth-century physical theories, elegant and powerful though they are, have not yet explained all the variability of natural rainbows. Rainbows are raggedly bright, some parts more colorful than others. They can shift, from a double to a single and back. The number of colors is legion, and shifts, as well. How? It is poignant that, after all the effort and energy expended over the centuries, we still have as many questions as our ancestors did.

—Raymond Lee, Jr.



JERSEYWOCKY

Have you ever taken that mimsy journey down the New Jersey turnpike? Then you'll recognize something in this poem.

Lewis Carroll's "Jabberwocky" is here burlesqued one more time, in a previously unpublished parody by the late Paul Kieffer (1881–1969).

Kieffer, a former Rhodes scholar from Franklin and Marshall College, was an attorney practicing in New York City. His niece, Eleanor Rutledge, believes the "Jerseywocky" was set to music and performed at New York's Century Club.

For best effect, read to a friend.

'Twas bergen and the erie road
Did mahwah into patterson:
All jersey were the ocean groves,
And the red bank bayonne.

"Beware the Hopatcong, my son!
The teeth that bite, the nails that claw!
Beware the bound brook bird, and shun
The kearney communipaw."

He took his belmar blade in hand:
Long time the folsom foe he sought,
Till rested he by a bayway tree
And stood a while in thought.

And, as in nutley thought he stood,
The Hopatcong with eyes of flame,
Came whippany through the englewood,
And garfield as it came.

One, two, one, two, and through and through
The belmar blade went hackensack!
He left it dead and with its head
He went weehawken back.

"And has thou slain the Hopatcong?
Come to my arms, my perth amboy!
Hohokus day! Soho! Rahway!"
He caldwell in his joy.

'Twas bergen and the erie road
Did mahwah into patterson:
All jersey were the ocean groves,
And the red bank bayonne.

BARRY GORDON
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LEAVING HOME

Entering college marks a watershed, for parent and child alike. I am proud of the young woman I've raised—but the house seems awfully quiet.

By Elise Hancock

I have a graduation picture on my desk. The girl is pretty—at least to a mother's eye—with dimples and wavy hair and straight white teeth. She has cut away the background of the photograph, drawn a graduation cap on a piece of paper, and inserted her head into the cap so the picture shows herself about to march down the aisle. The effect is subtly witty, and I gather she is pleased and excited about the end of high school, the beginning of college.

I can't be sure, though. Her letter didn't say. She's in France and has been all year, as an exchange student with a family near Paris. She comes home in July, then leaves for college.

In my mind are many other pictures. There used to be a little blond girl, muscular and solid when you held her. Some people's children seem wispy, and you fear you would crush their ribs if you hugged them hard. Katherine was not like that. Hugging her was like hugging a puppy, solid and warm and smelling faintly of sweat and the day's happy dirt. In my mind, I see her sitting on the floor, two years old or so, one chubby leg cocked in the air. She is struggling to put on her own sneakers—red sneakers. She liked red shoes. She looked up at me, beaming, and said, "Mother, what nice thing are we going to do today?"

Such a happy expectation. But that was the way she was, and some nice thing usually did come along. She might play in the sandbox, for example. Or the sprinkler. Or dress up the neighbor's kittens and take them for a walk in a doll carriage. Or she might find a wonderful new rock—do all children collect rocks? When she was about nine there were rocks lining our walls, rocks on the windowsills, rocks everywhere. They looked like just plain rocks to me, but she knew where she'd found every one. When she was old enough to do Christmas shopping, age three or four, I took her to the cigar store where the man helped her select the one perfect cigar for her grandfather. It took quite ten minutes to settle on the one with the aluminum case, and she was so pleased.

When she was in about fourth grade, I remember, she read a newspaper story about a high school principal who had kicked a middle-aged retarded man out of the school, where he'd been sweeping the halls and carrying water for the football team for years. The principal thought students should not know such a person. But Katherine has a brain-damaged relative, and she wrote the principal a letter about how it would do the students good to learn compassion, and how sweeping the halls had probably been the high point of the retarded man's day. (I'm sorry to say the fellow never answered her letter.)

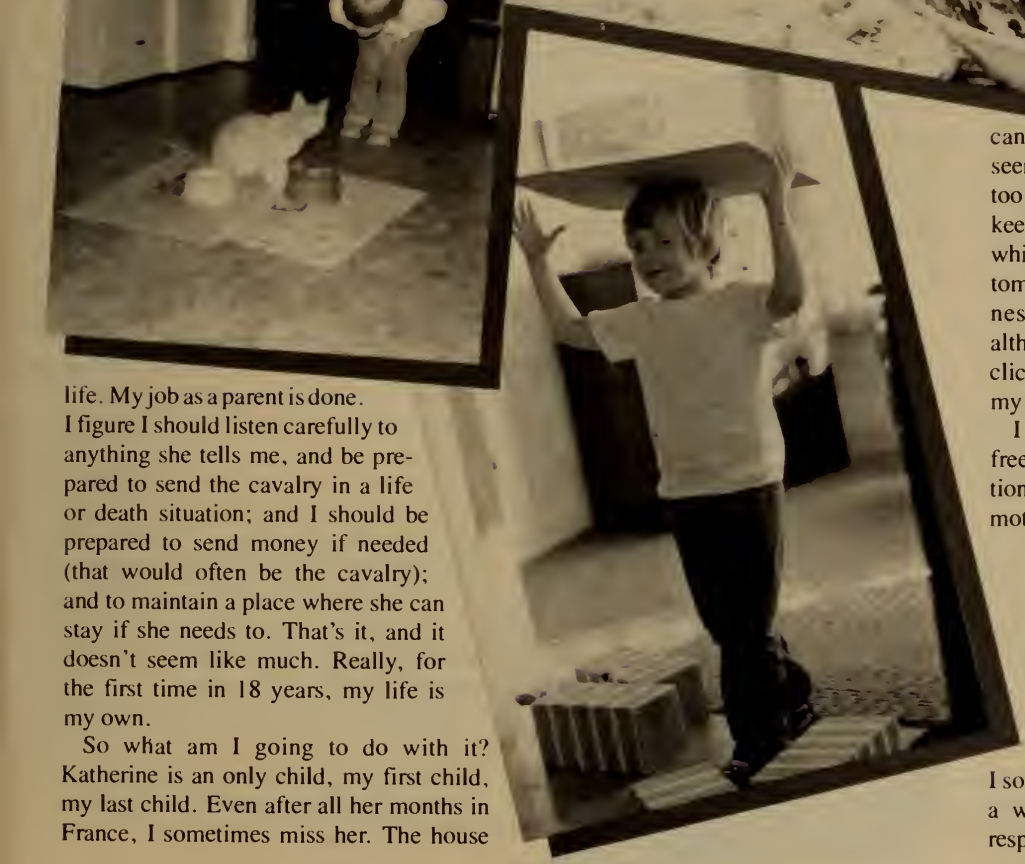
Whatever she did, she did intensely. In the summer, she liked to climb trees, ride bikes, catch fireflies. She'd run and run and run, and come in at night all sweaty and glowing with scraggly hair. I used to figure if she wasn't dirty she'd had a bad day. In the winter she liked to dress-up and give plays, and we kept a big chest full of old clothes and wigs and pieces of cloth, even a pair of rubber gorilla feet. She liked to make burpsy-boomer, which was any concoction of drinkable liquids—cranberry juice and root beer, for instance. The odder, the better. She liked to play store, for which we had a collection of old coffee cans and Cheerios boxes and such. And she liked stories. I read to her every night at bedtime, for years and years, from *Good Night, Moon* on into Laura and Narnia and the Borrowers. She would sit in my lap, in the rocker where my mother had once rocked me, and she'd be warm and heavy and smell like soap, and she'd grow heavier and heavier and heavier till I slid her limp into bed.

I still have artwork done by that child, laborious crayon outlines of people, big circles with little stick bodies. And a few of her toys, which visiting children are pleased to use—puppets and books and a few dolls and Playskool things. Even a few rocks. But the child herself is entirely gone. I can remember the warm weight in my lap, I can even feel it, but the child herself is gone. And that's what I find myself thinking about as Katherine prepares to go to college.

This wavy-haired college freshman is a wonderful person, warm and humorous and intelligent and everything a parent could possibly ask—except tidy—but she's not the little girl. Where did she go, so quickly?

And—corollary question—where did my youth go? A minute ago I was a young mother. Now I'm the mother of a college student. That makes me middle-aged, and I haven't gotten used to it yet.

So whose milestone is this? Katherine's, obviously. It is the beginning of her adult



life. My job as a parent is done.

I figure I should listen carefully to anything she tells me, and be prepared to send the cavalry in a life or death situation; and I should be prepared to send money if needed (that would often be the cavalry); and to maintain a place where she can stay if she needs to. That's it, and it doesn't seem like much. Really, for the first time in 18 years, my life is my own.

So what am I going to do with it? Katherine is an only child, my first child, my last child. Even after all her months in France, I sometimes miss her. The house can seem too quiet, too orderly. Nobody keeps me up to date on the latest films, which the young seem to know by tom-tom. Isn't this what they call the empty nest syndrome? Yes, I suppose so, although I hate to admit that any such cliché applies to a fine and unique soul like my own—and it's also freedom.

I don't like to admit to a sensation of freedom, either. To women of my generation, that is an ugly emotion unsuited to mothers, who are supposed to adore every moment of mothering. Still, I feel it.

Katherine's father has conscientiously tried to do what a father should do, but it is hard to play much of a personal role from a thousand miles away.

In fact, Katherine has been my responsibility since she was three, and the weight could be heavy. I sometimes used to wish that I could have a weekend, just one weekend, with no responsibility. To come in when I pleased.

To go out impulsively. To not cook if I wasn't hungry. That would be heaven, I thought.

Now I can have that heaven.

Our life was not idyllic. Katherine and I made her Halloween costumes together, yes, and all those things I've told you about. We had a marvelous time, much of the time. But in the several years after my marriage broke up, the child was—one would politely say demanding. Not her fault, of course: her world had turned somersaults. Still, she was difficult. At no time has she been punctual doing homework. As a teenager, she kept a bedroom into which it was not possible to walk. Really. We finally just shut the door. (How she emerged from that mess looking like an unrumpled rose I'll never understand.)

But I couldn't shut the door on the kitchen, and she was supposed to do the dishes. One time she assured me she *would* do the dishes, yes, she definitely *would* do the dishes, if only I would stop nagging. The problem was that I was such a nag. So I agreed to stop nagging. Three days later, when there was no dish or pot to cook or eat on in the house, I mentioned the matter. She told me I was nagging and she'd do it later—and I exploded. I was so angry that I scuffled and dragged her down the stairs, into the kitchen, and scrubbed her face with rancid potato peels from three days back. And then of course I helped her wash her face, and we both cried, and she helped me do the dishes.

Another time I got so angry that I bit her—wonderful. I'm not proud of that. I've often been inattentive. Also, I wish she hadn't spent so much time alone or with sitters; but I had to work, sometimes at night. I still don't see what else I could have done. Also, I wish I could have provided more in the way of art and music lessons, but I couldn't leave work all the time to chauffeur.

Well, no use thinking about it now. Done is done, and she has turned out well. Over the years, I have sometimes comforted myself with the thought that honest love might compensate for many flaws, and maybe it did. I also think I was lucky enough to be working with good genetic material, and that she herself has been tough and brave.

Of course, in a way the little girl isn't gone after all. Which is a new thought to me. Somehow I've been thinking as if her essence had been warmth and rock collecting and mudpies, and I feel that way. Caring for a small child is so tactile, even sensual: I remember two-year-old Katherine with all my senses, whereas the young woman is modest and I never even see her naked, let alone hold her as you would a baby. But the important part of the two year old endures: that sanguine, affectionate, concerned, involved, intense person is still there.

Katherine is one of life's winners—at least to the mother's eye, but I think truly. She has tact, compassion, and friends, both among her contemporaries and older friends (such as a former teacher). She is going to a most competitive college, and I think she'll thrive there. She may not play an instrument, but she already knows an enormous amount about films. She goes to museums for pleasure. Whatever she does with her life, she will do it with generosity and attention. I have visited her in France, and in her year there she has obviously gained in maturity, poise, and self-discipline.

We parted on a Sunday, in London, after a few days of riotous play-going. I was packing to catch a plane at Heathrow, she to catch the boat-train at nearby Victoria. "Well," she said, "goodbye, Mother, thank you for the *wonderful* time," and she hugged me hard, kissed me goodbye, picked up her suitcase, and left for the continent.

And after it was too late, it suddenly struck me that she, 17 years old, had never taken the boat-train before. My baby! Why hadn't I gone with her? The answer was obvious: she knew where Victoria was, and we both knew she didn't need help. She hadn't even asked for money! Here was an independent adult.

What a happy circumstance. How proud I am.

Yet I wish I could have the little girl too, at least for a visit. Or long enough to snuggle her, anyway.

WPI CLASS NOTES

WPI Alumni Association
President, Harry W. Tenney, '56
Senior Vice President
Paul W. Bayliss, '60
Vice President
Richard B. Kennedy, '65
Secretary-Treasurer
Stephen J. Hebert, '66
Past President, Peter H. Horstmann, '55

Executive Committee
Members-at-Large
Henry P. Allessio, '61
Walter J. Bank, '46
William J. Firla, Jr., '60
Patricia A. Graham Flaherty, '75

Fund Board
Allen H. Levesque, '59, Chair
Edwin B. Coghlin, Jr., '56
Richard A. Davis, '53
C. John Lindegren, Jr., '39
David B. Denniston, '58
Francis W. Madigan, Jr., '53

1917

Brig. Gen. **H. F. Safford,** retired from the U.S. Army, writes that he is celebrating his 90th birthday this August.

1929

Percy Newton belongs to a retirement golf league and plays up to five times a week "in season." He also has more than six acres—with a big lawn and garden—to keep him busy. In the winter he bowls.

1930

Myrton Finney writes, "I have the good fortune to see my children frequently. I have four grandchildren." Myrton retired from Bell of Pennsylvania 14 years ago.

Wilson Rice says he's so busy in retirement that he hasn't found time to join the Golden Agers. He's been restoring wooden antiques and helping to repair a Masonic temple and a church. He's traveled to Arizona, Florida, Maine and Cape Cod, where he's done a little fishing.

Arthur Zavarella was one of thousands of amateur radio operators from New England who responded to greetings from astronaut Owen Garriott as the space shuttle *Columbia* approached the coast of North America in December.

1932

Last October, **Francis Blouin,** retired from the Navy, participated in Tokyo as a member of the U.S. delegation in an international conference, "Security of Sealanes of Communication."

1933

Kenneth Gleason writes that he had a great time seeing the Phi Sigs who returned for last year's 50th reunion. He lives in Newton, MA.

1935

Leonard Humphrey currently serves as village engineer in Chevy Chase, MD. He is concerned with street lighting, storm drainage and remodeling the village office building.

Donald MacMillan was recently elected chairman of the board of the Upper Blackstone Water Pollution Abatement District Commission. He is the last remaining original member of the three-man commission, which was formed by Worcester and Auburn to build a $26-million plant. Mr. MacMillan, who took an environmental engineering course at Springfield Technical Community College, retired as a senior product engineer in the electrical cable division of U.S. Steel Corp. in 1972.

1936

Leonard Johnson of Amesbury, MA, spends his time boating, gardening, traveling, visiting children, consulting, administering a foundation, maintaining his property, reading and corresponding. Retired for ten years, he is also conducting genealogical research.

1938

Last August, **Robert Abbe** attended his 13th Phi Sigma Kappa national convention since 1952. It was held in New Orleans. One of his granddaughters now lives in Florida, so there will be one or two trips south each year.

1939

Henry Blauvelt still works for the Public Service Electric and Gas Company in Newark, NJ. He writes, "**Warren Harding, '42,** works on the same floor and we compare notes." Last winter the Blauvelts visited the **Tom Wingardners, '40,** at their retirement home in Marco Island, FL.

1940

Kenneth Fraser recently retired from Markel Corp. and now works as a special products manager for National Wire & Cable Corp.

Zareh Martin, who writes that he "can't retire," has started his own consulting firm in value engineering.

Harry Terkanian is now retired from Raytheon and residing in Lexington, MA.

James Thurston has retired from the Waites Co., Worcester. He lives in Damariscotta, ME.

1941

William Carroll serves as district sales manager for Wiginton Fire Sprinkler, Naples, FL.

Dr. **Charles Smith,** professor of mechanical engineering at Rose-Hulman Institute of Technology, Terre Haute, IN, spoke on engineering education at an international symposium held April 16–19 in Cologne, West Germany. His presentations at the World Conference on Education in Applied Engineering and Engineering Technology were "How Does One Teach Design: Lectures, Projects, Cases?" and "On Writing Engineering Cases."

1942

In December, **James Robjent** retired from Scott Paper Co. He resides in Waterville, ME.

1943

Robert Bierweiler, a registered professional engineer in 16 states, is currently the chief engineer at Natgun Corporation in Wakefield, MA.

Class of 1934, 50th Reunion

Forty-six members of the class checked in at our class headquarters at the Sheraton-Lincoln Inn on Thursday, May 31. That evening President and Mrs. Edmund T. Cranch welcomed us at a reception in their lovely home. Following this, we moved to Higgins House for our 50th reunion dinner party as guests of WPI.

On Friday, the rainy weather put a damper on most of the planned outdoor activities, like golf and tennis, though we took part in seminars, tours and indoor tennis during the day. At noon, we enjoyed a pleasant buffet luncheon in Morgan Hall.

Friday evening we gathered at the Sheraton-Lincoln for our class banquet. John Keenan was MC. Also speaking for the class were Charlie McElroy, reunion chairman, and Everett Sellew, class president. Our guests were Mr. and Mrs. Robert Reeves. Bob is vice president for Student Affairs at WPI. He gave us a lively run-down on recent events on the Hill and outlined what is being planned for the future.

On Saturday morning, following a continental breakfast hour at Morgan Hall, we attended the 50-Year Associates meeting at Kinnicutt Hall. At this meeting, Prof. Donald Zwiep, head of the ME Department, gave a fascinating talk with outstanding color slides on his recent year as president of ASME, including an extended trip to the Orient, Hawaii, Japan, China and Indonesia. At the traditional Reunion Luncheon on Saturday in Harrington Auditorium, John Keenan presented our 50th reunion gift of $141,721.91 to the college. This included corporate matching gifts.

Our class won the Class of 1917 Attendance Cup with an attendance of 48.3 percent of our members able to attend the reunion.

See you at our 55th!

Howard A. Whittum
Class Secretary, 1934

He has written several articles for professional journals. The Bierweilers have two children and two grandchildren and reside in Needham.

Calvin Holden retired from PPG Industries last December. He is considering doing some consulting. Meanwhile he helps his wife with her antique business and is still heavily involved in Scouting.

1944

In February, **Irv Gerber** left Gerber Sales Corp., his electronic manufacturers' representative business which covers New England. He writes, "After 37 years, I'm selling my interests to the employees, but will continue to handle some special projects for the company." Irv was in the electronics industry for 40 years. And he's not really retiring. For the next two years he'll be attending the Bennett School full time, learning to design and build period furniture. He says he's always "had a love affair with woodworking," and that he's merely "trading electrons for sawdust."

1946

Howard France holds the post of president of Altair Equipment Co., New Hope, PA.

Joseph Pofit of Ludlow, MA, continues with Crane Co. in Indian Orchard.

1947

Harold Cole, now retired from Raytheon, is currently residing in Saco, ME.

1948

In March, **Arne Kellstrom** joined Hoerbiger Ventilwerke AG in Vienna, Austria. Following a training period, he is scheduled to go to Singapore to help develop the firm's Southeast Asia market. In 1983, he retired from Ingersoll Rand after more than 35 years of service. His last post was as vice president and general manager of the oil and gas compressor division. Before he joined the Vienna firm, the Kellstroms took a short vacation in Greece.

1949

Robert Bareiss has been elected to the board of directors of the Technical Association of the Pulp and Paper Industry (TAPPI). He is director of process-control technology at St. Regis Corp. in West Nyack, NY. He holds degrees from WPI and Boston University.

Eugene Briggs holds the post of plant manager at Baker Equipment Engineering Co., Richmond, VA.

George Carlson serves as laboratory supervisor at BIW Cable Systems in Plymouth, MA.

Norman Cotnoir, formerly with Brown & Sharpe Mfg. Co., North Kingstown, RI, has retired.

Sidney Madwed, president of Attitude Developers and Consultants, Bridgeport, CT, was guest speaker at the January meeting of the Fairfield Board of Realtors.

Dan McQuillan is semi-retired as a general management consultant and corporate director of McQuillan Associates in Venice, FL. He is treasurer of McQuillan Fisheries Inc., Deep Ocean Fishing.

In April, **Henry Oletz,** facilities-budget engineer for Wyman-Gordon Co., North Grafton, MA, received the Reginald Washburn Award from The Worcester Boys' Club Alumni Association. The award is given to a board or corporate member of the club who has given extraordinary service to the organization. Oletz, who attended Clark, has a master's degree from Northeastern.

Edward Pepyne continues as an attorney and a professor of law at the University of Hartford in Connecticut. He has five degrees and has held education-oriented jobs with public schools in Massachusetts, Connecticut and Rhode Island and at Michigan State University. For 12 years, he was an educational-program consultant for Aetna Life & Casualty.

1950

The **Bill Bowens** recently returned from "a great trip to Australia, New Zealand and the Fiji Islands."

John Orcutt is manager of technical awareness at Combustion Engineering in Stamford, CT.

John Seguin is an account executive for Norton Co. in Newport News, VA. His daughter, Susan, works for the Tax Council in Washington, DC. Jane is a senior in high school. Son Steve works in computer sales for NCR, Norfolk.

1951

In March, Dr. **Donald Sands** was named vice chancellor for academic affairs at the Lexington campus of the University of Kentucky (UK). A professor of chemistry, he had been associate vice president, then associate vice chancellor for academic affairs since 1981. Also, he has served as associate dean and acting dean of the UK College of Arts and Sciences. He holds a doctorate from Cornell. Before going to UK in 1962, Sands was senior chemist, Lawrence Radiation Laboratory, Livermore, CA.

Donald Spooner has been appointed manager of the advanced technology program for Kodak's U.S. apparatus division, Rochester, NY. He started with the company in 1952. Prior to his promotion, he was managing engineer of product engineering with the advanced technology program. He has an MSME from MIT.

1952

Walter Connor, former manager of Raytheon's equipment development laboratories in Wayland and Sudbury, MA, has been named as general manager of the firm's electromagnetic systems division in Goleta, CA. With Raytheon since 1968, Connor had previously served as manager of the communications systems directorate, directing all technical, business and marketing aspects of Raytheon's military communications systems. Earlier he was responsible for development of ground-based tactical communications systems. He belongs to the IEEE, the Armed Forces Communication and Electronics Association and the Association of the U.S. Army.

1953

Brady Buckley serves as president of Buckley-Owens Machinery Corp. in Fayetteville, NY.

Robert Eisenberg continues as regional sales manager for TRW in Mahwah, NJ.

John Flood is vice president and general manager of Eckel Industries in Cambridge. He still enjoys sailing his Pearson 10M, as well as competing in the Marion Bermuda Race and sailboat races on Buzzard's Bay.

Herbert Narbeshuber is general manager of Bauer Gear Motors Inc. in Somerset, NJ.

1954

Robert Luoma serves as senior engineer for GE in Sunnyvale, CA.

William Zerlin holds the post of applications engineering manager at Solitron-Microwave in Pt. Salerno, FL.

1956

Dr. **Roger Tancrell** has been named a consulting scientist at Raytheon's research division in Lexington, MA. Since joining the company in 1968, he has held increasingly responsible positions: the position of consulting scientist is the highest scientific level attainable at Raytheon. The holder of seven patents, Tancrell has a master's degree from MIT and a PhD from Harvard.

John Taylor does air-traffic control research at Boeing and teaches at Cogswell College.

A. Ronald Thomas, manager of the materials-management project at Public Service Company of New Hampshire (PSNH), wrote "Introduction to Bar Coding," which appeared in the December issue of *Utility Purchasing and Stores* magazine. He is currently involved in the design and implementation of an integrated materials system in support of purchasing, accounts payable and stores functions for transmission, distribution and production. As manager of the PSNH materials department, he helped develop central warehousing and delivery.

1957

Leon Morgan has been elected to the board of directors of the Connecticut Society to Prevent Blindness. He is senior vice president of finance and accounting at United Illuminating Company in New Haven, and a registered professional engineer. He belongs to the Kiwanis Club of New Haven and the Quinnipiac Club.

Collins Pomeroy is division staff manager with NYNEX in White Plains, NY. Last year he received an MS in advanced management from Pace University.

1958

Michael Gutman has been named vice president of product engineering at Apollo Computer, Chelmsford, MA. Prior to joining Apollo, he spent ten years with Digital Equipment Corp. (DEC), where he served as product manager for storage products, engineering manager for memory products and manager of DEC's small systems engineering group. He has a BSEE and an MSEE from WPI.

Bernard Podberesky serves as general manager of strategic planning and materials for GE's nuclear business in San Jose, CA. "My third daughter starts college in the fall," he says.

1959

Donald Carignan continues as president of Instrument Technology Inc. in Westfield, MA. The firm specializes in remote-viewing systems for viewing hostile environments, such as the inside of nuclear reactors. Don is also chairman of the standards committee for the American Nuclear Society on remote inspection. His consulting activities have taken him to the International Atomic Energy Agency in Vienna and other places around the world.

Michael Hertzberg heads Consulting Engineers Inc., a firm located in Waitsfield, VT, and concerned with engineering for architects, industry and government agencies in many fields, including plumbing, heating and energy management. He is a registered professional engineer in Vermont, New Hampshire and Massachusetts, a past president of the Consulting Engineers Council of Vermont, and past national chairman of the American Consulting Engineers Council (ACEC) interprofessional and business practices committees. A past member of the ACEC planning cabinet, he is a recent past national vice president of the council. He is active in community affairs in Waitsfield and likes polo and skiing. The Hertzbergs have two daughters.

Last summer, **Edward Koch** left Raytheon to become a principal in Rhodes Engineering, Middletown, RI.

Dr. **Allen Levesque** is now a senior engineering specialist for Digital Communication Systems, Sylvania Systems Group, in the communications systems division of GTE Products Corporation, Natick, MA. Last winter he and a co-author completed a book on digital communications scheduled for publication next year by Wiley-Interscience. Al enjoys hiking and has done many of the AMC trails in New Hampshire and Vermont. The Levesques have a daughter who graduated last year from Smith, another who is a student at Merrimack College, and a son in high school.

Robert Pill is president of the Ralph Pill Electric Supply Co., Boston, which has eight branches in Massachusetts, New Hampshire and Maine. His wife, Cynthia, a licensed clinical social worker, is studying for her doctorate at Simmons. The Pills, who have three children, enjoy travel, skiing, sailing and tennis.

George Schreiner is currently a project engineer for Raytheon, managing the development of a trainer for the Patriot missile system. Earlier he had been with Honeywell for nine years. He has an MS from Northeastern. He and his wife, Betty, have a daughter, Meghan, 1, and three sons.

Two years ago, **Bob Smith** retired as a lieutenant colonel (USAF) and as chief of management information systems at Rome Air Development Center. Since then, he has been director

Class of 1944, 40th Reunion

On Thursday, May 31, The Great Class of 1944 convened its 40th reunion *in a downpour of rain*: Sixty-one members, along with 50 wives and one daughter, were present.

Our reunion started off with a Boston Pops Concert, a first for a WPI reunion.

Friday saw an all-reunion golf tournament—*in the rain.* This was followed by an early evening cocktail party hosted by Dr. and Mrs. Edmund T. Cranch—*Will it ever stop raining?*

After retiring to Higgins House for a Class of '44 Clambake, we returned to the Hospitality Suite for more fun and talk. *The Civil Engineers started designing an ark.*

Saturday morning saw the class assembled—*in the rain*—for campus tours. There was a dedication of the new carillon in Alden Memorial tower, a gift from our class to the school. *The ME's gathered materials for the ark.*

At Reunion Luncheon, Erling Lagerholm made the presentation of the Class Gift—$232,030, including matching corporate funds and interest—*Why is it still raining?*

That evening the Class of '44 held its 40th reunion banquet at the Yankee Drummer Inn. Dr. and Mrs. Cranch, honorary members of the Class of '44, were in attendance.

George Vogel, Jr. and his wife were also our guests. George is the son of the late George Vogel, Sr., '44, who lost his life in military service shortly before George was born. The Class of '44 wanted George to know what a fine person his dad had been.

Jim Donahue was MC. Amid all the highjinks of the evening, he convinced us that he and Dr. Cranch were the only two people in the U.S. still working—and Jim wasn't too sure about the president. *When will it stop raining?*

The reunion came to an end on Sunday morning with a brunch in Morgan Hall, where we all said our final farewells. *And the sun came out!*

FOR SALE: ONE PARTIALLY BUILT ARK

—Buzz Gerber '44
Reunion Chairman

Lt. Col. Normand Noel Promoted to Colonel

In formal ceremonies held recently in Providence, RI, Lt. Col. Normand L. Noel, '61 CE, was promoted to full colonel in the United States Marine Corps Reserve. Major General John J. Salesses, assistant base commander, Camp Lejeune, NC, officiated, while Mrs. Tess Noel, Col. Noel's mother, pinned on the eagles of her son's new rank.

At the same ceremony, Col. Noel was awarded the Navy Commendation Medal for meritorious service. He is a veteran of 24 years of Marine Corps service, having served with the First, Second and Fourth Marine aircraft wings.

After receiving his BSCE from WPI, Norm served three years' active duty as a platoon commander in the regular Marine Corps. Upon completion of active duty, he decided to continue his affiliation with the Corps through the Marine Corps Reserve. In 1966, he graduated from the University of Connecticut with a master's degree in business administration. He was elected to Beta Gamma Sigma, the national honorary business society.

For the last 13 years, Norm has been associated with Gilbane Building Company of Providence, RI. Starting as manager of business development in New England, he went on to open new offices for Gilbane in Washington, DC, and Houston, TX. He led the effort in winning major new projects for Gilbane such as the District of Columbia new court facility, the Orlando International Jet Port and the Strategic Oil Storage Program for the United States.

Having now switched over to the development side of the house, he is currently a project developer with Gilbane Properties in Providence. He resides in East Greenwich.

Col. Noel receiving his eagles

of administrative services for Measurement Concept Corporation in Rome, NY. Bob, who has an MBA from Xavier University, officiates at soccer and lacrosse games at high school and college levels.

Wilford Sutthill, a superintendent for GPGA, Beulah, ND, is involved with the start-up of the nation's first full-scale coal gasification plant.

Tom Waage and his son, **Richard, '86,** are slated to participate in the 1984 Bermuda race. Two years ago, they took fifth place. Daughter Cindy also is a good sailor. The Waages live in Bricktown, NJ. Tom is president of the family business, Waage Electric Inc.

Robert Walker holds the post of sales manager with Fischer & Porter Co., Warminster, PA.

Ernest Woodtli continues as head of production engineering at Hughes Aircraft Co., Tucson, AZ. His wife has a PhD and teaches at the University of Arizona, where their son plays basketball on scholarship.

Fred Lutze, Class Secretary

1960

Paul Allaire is now senior vice president and chief staff officer of the Xerox Corporation in Stamford, CT.

Last fall **Martin Beck,** a manager at the Cabot Corporation in Billerica, MA, was elected chairman of the Northern Middlesex Area Commission. He also serves as director of the Massachusetts Federation of Planning Boards and as vice chairman of the Massachusetts Association of Regional Planning Agencies. He is a former chairman of the Pepperell Planning Board and a member of the town growth policy committee and the state hazardous waste committee.

Paul Byron serves as a senior resident inspector for the U.S. Nuclear Regulatory Commission in Glen Ellyn, IL.

James Mahan is marketing manager in the slurry pump division at Goulds Pumps in Baldwinsville, NY.

Dr. **Derek Morris** is now an associate professor of electrical engineering and computer science at Stevens Institute of Technology, Hoboken, NJ. From 1960 to 1983, he was a member of the technical staff at Fort Monmouth, where he did communications and computer research. While at Monmouth, he led a research project in artificial intelligence and helped develop Ada, the new government high-order computer language. He has an MSEE from Newark College of Engineering and a PhD from Stevens. Besides teaching at Monmouth College, he has been a consultant to private industry on software design and hand-held graphics.

Ed Russell, general manager of GE's International Lighting, was a speaker at a recent GE general management conference.

Louis Varuzzo has been promoted to senior engineer at the IBM East Fishkill (NY) plant. He joined the firm in Poughkeepsie in 1960 as a technical writer and had served as development engineer and advisory engineer. He is the recipient of a People Management Award and a Quality Excellence Award.

1961

Amory Aldrich holds the post of vice president of the Bank of Boston.

Henry Allessio is now a partner with Easton Consultants Inc., in Stamford, CT. The firm does development and marketing consulting.

Richard Ledoux works as director of manufacturing in the medical electronics division at Honeywell Inc., Pleasantville, NY.

1962

Daniel Brosnahan is regional marketing support manager for Prime Computer Inc., Parsippany, NJ.

Jay Hochstaine is lead engineer for Analytics in McLean, VA.

Richard Sharkansky, who is managing patent attorney for Raytheon in Lexington, MA, has an MSEE from WPI and an LLB from Suffolk University Law School.

1963

Dick Dann, staff editor of *Machine Design* magazine, has won a Jesse H. Neal Certificate

Marvin Richmond

Reunion '84: The Springfield Kiltie Band, a tradition at WPI Reunion.

of Merit for his four-part series of editorials helping readers to understand the social and cultural forces that shape designs in the auto, aerospace, machine tool and farm equipment industries. Of 641 entries submitted, 15 were awarded the Certificate of Merit. The Neal awards are regarded as the most prestigious editorial awards in business press publishing.

Dick Kashnow, general manager for GE Quartz and Chemicals, took part in a recent GE general management conference.

Michael Kulig is plant manager for Monsanto Co. in Bridgeport, NJ.

Bob Maynard and **David White, '75,** of R.H. White Construction Co., Auburn, MA, presented a special program at the Worcester Engineering Society annual banquet held in Shrewsbury in February. The title of the program was "The Construction of Mt. Wachusett Ski Area—A Team Effort."

Warren Standley continues as a project manager with TRW Inc. He and Barbara have four children and reside in Acton, MA.

Bill Zinno holds the post of manager of materials at Dresser Clark, Olean, NY.

1964

MARRIED: S. William Wandle, Jr. and Caroline Haworth on February 18, 1984, in Chelmsford, MA. Graduated from Bates College, she has a master's degree from URI and a doctorate from the University of North Carolina. In private practice in Westboro, MA, she is also employed by the Framingham public

Class of 1959, 25th Reunion

If a laugh-meter had been in use during Reunion Weekend, the Class of 1959 would have won top honors hands down.

The highlight of the weekend was the dinner dance Saturday evening, where Jack McManus gave full vent to his talents as an MC and stand-up comedian. (Watch out Johnny Carson! Not to mention, Alan Alda—Jack is a dead ringer!)

Other highlights of the dinner dance were reminiscences given by Joe Bronzino and Bill Curran, as well as by faculty and staff members Merl Norcross, Carl Koontz, Donald Zwiep, Bill Grogan, '46, and Bill Task.

Additional weekend activities included a warm welcome from Dick Bratt and Dave Sawin in the hospitality suite, photography and stained glass seminars, a personal-computer program and campus and city tours. Also, various open houses, a panel discussion on WPI today, and a New England Clambake. Saturday featured the Reunion Luncheon and a 25th reunion reception at the home of Dr. and Mrs. Edmund Cranch.

Sidelights: Fred Costello flew all the way from Hong Kong. Mike Hertzberg came down from Vermont to present the class gift of $128,715. And several other classmates got here from Florida, Texas and California. The class set a record for total attendance.

Kudos to the following committee members for a fun-filled reunion: Dick Bratt, Joe Bronzino, Don Ferrari, George Fotiades, Norm Hiatt, Tom Humphrey, Bob Kieltyka, Jack McManus, Norm Monks, Tom O'Connor, Phil Puddington, Ed Salunier and Dave Sawin.

Al Levesque
Reunion Chairman

Marvin Richmond

Reunion '84: Maggie and Al Larkin, '44.

Reunion '84: Alice Carlson, Ella and Donald Wilson, '24, and Carl Carlson, '29.

school system. He is with the U.S. Geological Survey.

Peter Baker is involved with a "start-from-scratch" mediation center and counsels those convicted of drunk driving.

Peter Dornemann has been appointed director of marketing at Bellofram Corporation, Burlington, MA. He holds an MBA from the Wharton School of the University of Pennsylvania and has extensive experience in strategic planning and new product development. Most recently, he was director of marketing at Digilab in Cambridge.

John Gulliksen is now vice president of product development for Koehler Mfg. Co., Marlboro, MA.

Currently, Dr. **Al Potvin** serves as director of medical instrument systems research at Lilly Research Laboratories, Indianapolis, IN.

Frank Stone was recently named Eastern regional manager responsible for sales and service at Inland Specialty Chemical Corp. Prior to joining the Costa Mesa, CA, firm, he was vice president of engineering for Automata Inc., Reston, VA, and manager of printed circuit products for Enthone. He holds an MS in chemistry from Southern Connecticut State College and has published several papers on processing PC boards.

Robert White is now director of engineering at Data Translation, Marlboro, MA. **Fred Molinari, '63,** is president of the company.

1965

Philip Baker was recently named director of the video games division of Imagic, a Los Gatos, CA, computer firm. He holds 21 patents.

Edward Cheffetz is president of Intelligent Graphic Systems Corp., Bloomfield, CT.

1966

Robert Levine has been named vice president of Huck Manufacturing Company's international division, located in Irvine, CA. With responsibilities on five continents, he writes, "I do quite a bit of traveling around the world." He enjoys golf and tennis.

Peter Lukesh is section manager for Raytheon Co. in Bedford, MA.

Frank Pfeiffer has been promoted to professor of management at Nichols College, Dudley, MA. He joined the Nichols faculty in 1973 and holds a doctorate in business from UMass, as well as an MBA from Boston College. Since 1979, he has been chairman of the business management department.

Roy Warfield is a propulsion system representative for Pratt & Whitney Aircraft, East Hartford, CT. He and his wife, Donna, reside in San Diego, CA.

1967

John Downes holds the post of district sales manager at Fafnir Bearing in Southfield, MI.

John Feldman has joined Raytheon, Lexington, as manager of industrial hygiene and materials safety. Previously, he was a manager of environmental programs for GE.

Marvin Richmond

Reunion '84: Class of '64 members at their Higgins House Reunion Dinner.

Sherry Horeanopoulos

Reunion '84: Harold Humphrey, with Eleo and Walley Abel, '39.

Steven Frymer serves as a senior civil engineer for the Massachusetts Department of Public Works. He has two children, Rebecca, 5, and Sam, 2.

Greg Goulet, who heads Fawn Realty, Nashua, NH, has served as treasurer and director of the Greater Nashua Board of Realtors; president, treasurer and director of the Southern New Hampshire Multiple Listing Service, and as a member of many state and local realtor committees. Last year, Fawn set up a commercial-investment division and this year it will enter the field of real-estate securities sales.

Joseph Slocik is a senior engineer of advanced transformer development at GE. He has written several technical papers and has submitted nine patent dockets. The Slociks have two children and reside in Pittsfield, MA.

With Ford Motor Company since 1972, **Alan Suydam** was named supervisor of Mustang and Thunderbird body structure and sound package development in January.

1968

BORN: to Mr. and Mrs. **Richard Kung** a daughter, Catherine Ann, on September 24, 1983. . . .to Charlotte and **Bill O'Neil** a daughter, Megan Kathleen, on October 24, 1983. Megan has a brother, Sean.

Cobb Goff is a photographic engineer for Kodak in Findlay, OH.

Frank Kuszpa has been named director of operation and maintenance at the University of Hartford. Formerly he was assistant director. Before going to the university, he worked for St. Lawrence University, the Canton (NY) public school system, Hobart and William Smith

Reunion '84: Student Ed Ortler and George Gove, '18.

Colleges, Vassar, Brandeis and Monmouth College. He was also director of facilities operations at Columbia, director of engineering at Danbury Hospital, and an engineer for Pratt & Whitney Aircraft for eight years. He has an MSME from RPI.

Paul Larini was recently appointed director of competition and conservation services at State Mutual in Worcester. He has a master's degree from Northeastern. In 1971, he joined State Mutual, being promoted to manager of individual reinsurance services in 1978. In 1981, he earned the Society of Actuaries professional designation of associate.

Timothy Schaffernoth was recently promoted to manager of industrial process and environmental engineering at Rist-Frost Associates, Glens Falls, NY. A licensed professional engineer in New York, he holds an MSCE from the University of Maine. He has written for the *Journal of the American Water Works Association* and belongs to a number of technical associations.

Dr. **Wayne Turnblom** is a market intelligence associate at Eastman Kodak, Rochester, NY.

1969

Reunion **September 22, 1984**

BORN: to Mr. and Mrs. **Donald Esson** a son, James William, on June 2, 1983. . . .to Dr. and Mrs. **Paul Shea** their first child, Patrick Thomas, on July 27, 1983. Shea, who has a master's and a PhD from URI, is a division engineer for Du Pont in Victoria, TX.

Maj. **Warren Anderson** is command control specialist at Hickam AFB, Hawaii.

John Gavitt, who just returned from a long business trip to Japan, says, "Will be heading for Italy next."

Alexander Malcolm has been promoted to vice president for research and development at Briox Technologies, Worcester. He is responsible for technical resources, new product development, joint ventures, licensing and acquisitions.

Al Pauly is a senior research engineer at Michelin America's R&D Corp., Greenville, SC.

John Poblocki has been named vice president of real-estate acquisitions at Mutual Benefit Financial Service Company, Providence, RI. His duties include the formation of joint venture syndication and the acquisition of real estate for investment and syndication product. Prior to joining the firm in January 1983, he was executive vice president of Kates Properties. He has a master of arts degree in community planning from the University of Rhode Island.

Last year, **Robert Reidy** joined Nelson-Scribner Associates, Norwood, MA, a manufacturer's representative firm headed by **Stu Nelson, '66.**

James Rossi, a project engineer with Stone & Webster, was co-author of "Combined Cycle Coal Gasification: Options for Power Plants," which appeared in the February issue of *Power Engineering.* At Stone & Webster he is responsible for technical and administrative supervision of synthetic fuel projects. Also, he has supervised power generation projects for the firm. Previously, he was associated with General Dynamics, Quincy Division, and Pratt & Whitney Aircraft.

John Simpson is now with the Naval Coastal Systems Center, Panama City Beach, FL, where he does R&D of life support equipment and systems for the U.S. Navy.

John Starsiak serves as assistant patent examiner at the U.S. Patent and Trademark Office in Arlington, VA.

Martin Surabian is currently a project engineering manager with Bechtel Power Corporation. He says, "I have a baby daughter, Karen Talin."

B. Lee Tuttle, an assistant professor of mechanical engineering at GMI Engineering & Management Institute, wrote "The Emerging Role of Thermal Analysis in Aluminum Foundry Process Control" for the December issue of *Light Metal Age* magazine.

1970

BORN: to Mr. and Mrs. **Roger Henze** a son, Kevin Andrew, on July 8, 1983.

Dr. **Maria Allo** is now assistant professor of surgery and director of surgical intensive care at Johns Hopkins Medical Institutions, Baltimore, MD.

Garreth Cooke works as a design engineer for GE in Wilmington, MA.

Dr. **Robert Markot** is on the technical staff at Automation Technology Products in Campbell, CA.

1971

Barry Belanger is currently a senior system design engineer at GE's medical systems group

Lt. Col. Poplawski—Still Flying High

If Henry Poplawski's ('39) life were made into a movie, no one would believe it. He is now a retired lieutenant colonel in the USAF. But, during World War II and the Korean conflict, Poplawski flew high.

Take that time back in '42, when his mission was to fly General "Vinegar Joe" Stilwell across Africa to India and China, where he was to take command of Allied ground forces in the China-Burma-India theater.

"Stilwell wanted an air view of Jerusalem, so we flew ground contact with a 300-ft. ceiling up a mountain road to the city," says Poplawski. "When the general thanked me for the impressive view, I didn't tell him we'd been at stalling speed all the way!"

How did an aspiring engineer (he spent only one year at WPI) end up chauffeuring "Vinegar Joe?" Poplawski says, "I couldn't afford to go back to Tech sophomore year because of the Great Depression, so I joined the Air Corps."

In 1941, he was a civilian pilot helping Pan American Airways set up a trans-Africa, Middle East, India route to China. On Dec. 7, he was asleep in an RAF billet, "when my batman woke me up saying, 'You're in it now, Yank.'"

Soon after the Stilwell mission, he took a job as test pilot at Glenn L. Martin Co. in Baltimore, MD. The firm had the Air Corps cancel his recent induction. "I believe I was the only first lieutenant reserve officer not recalled to duty during World War II."

In 1948, he received his BS in aeronautics from the University of Southern California. As a captain during the Korean conflict, he helped set up the USAF Guided Missile School at Lowry AFB, Denver, CO. In 1966, he retired from the Air Force following aerospace intelligence assignments. In 1977, he retired from the civil service.

Currently, Poplawski and his wife, Claytrice, travel on space-available military flights. "Flying," he says, "will always be in my blood."

Henry Poplawski at his 45th reunion in June.

in Milwaukee. He is working on his PhD in biophysics at the Medical College of Wisconsin.

Joseph Bellino serves as mechanical engineering manager for GE in Orlando, FL. He and his wife, Patricia, have two children and reside in Longwood.

Paul Bienick is assistant superintendent of engineering at Stone & Webster in Shippingport, PA.

Thomas Copp is now vice president of manufacturing at Quabbin Wire & Cable Co., Ware, MA. He and his wife, Mary Jane, and son, Tim, 3, live in Amherst.

Daniel Donahue holds the post of senior engineer at Green International in Somerville, MA. He has an MS from Tufts.

Dr. **Baljit Gambhir**, a senior supervisor for Shell in Houston, TX, has a PhD from WPI.

Jack Greenshields is a business manager for AceticAcid/Menthol for the Monsanto Industrial Chemicals Company in St. Louis.

Larry Hyman teaches service respresentatives new product development in Dow's consumer products department. His wife, Ann, has a BA from the University of Michigan and works for Dow as a legal abstractor.

Donald Peterson now holds the post of vice president of finance at Northern Telecom Inc. In October, he, his wife, Maureen, and two children moved from Toronto to Nashville, TN.

In December, **Robert Pettit** was promoted to manager of engineering at Doron in Binghamton, NY. He started with the firm in 1973. Previously, he was project engineer, senior systems engineer and systems engineer.

Abbas Salim is now a technical consultant for solar photovoltaic power systems R&D at Saudi Arabian National Center for Science and Technology in Riyadh, Saudi Arabia.

Fran Scricco, general manager-commercial for GE's video products, was a speaker at a recent GE management conference.

John Sperandio is temporarily with the Veroala School in Malta.

Michael Zarrilli continues as vice president and district head of Manufacturers Hanover Trust in New York City. He and Diane have two children and reside in Cos Cob, CT.

1972

BORN: to Mr. and Mrs. **Joseph Harkins, Jr.** a son, David Edward, on November 5, 1983. David joins sister Kimberly, 7, and Joseph III, 3. . . .to Mr. and Mrs. **Neil Herring** their second child, Amelia, in July of 1983. Last summer, Neil began a new job as director of planning and development with Damon Corp., Needham Heights, MA. He is responsible for corporate acquisitions and new projects for the Medical Services Group.

Currently, **Charles Bacon** serves as senior educational technologist for Data General in Westboro, MA. He and his wife, Nancy, reside in Westminster.

Dr. **James Colangelo** is in private practice of medicine with Northeastern Nephrology Associates.

Arthur Geetersloh holds the post of president at New England Forest Products Inc., Greenville, ME.

Dr. **William Goodhue** is research scientist for thin-film technology at UTRC in East Hartford, CT.

Rae Johnson is now manager of engineering and manufacturing for P/A Industries in Bloomfield, CT.

Robert Shawver serves as principal engineer at WSSC, Laurel, MD. This year he will graduate from the University of Maryland Law School.

Joe Spurlock now teaches in the Forest Hill school district, Cincinnati, OH.

1973

MARRIED: Dean Bertoldi and Kristine Ciambriello in Trumbull, CT, on October 21, 1983. She graduated from Paier Art School and is assistant art director at Phoenix Mutual Life Insurance, Hartford. He also attended Paier and Clark University and is with Feathers Design, Rowayton.

BORN: to Kathleen and **Timothy Jurzynski** their first child, Thomas Edward, on August 27, 1983. Tim is a quality control manager at Naugatuck Glass Company. The family resides in Seymour, CT. . . .to Lynn and **John Luikey** their first child, a son, Justin Knight, on September 28, 1983. . . .to **Bruce** and **Allison Huse Nunn** their third child, April Anne, on February 7, 1983. Brother Willy is 7 and sister Heather nearly 6.

Capt. **David Bedard,** who is with the U.S. Army's Redstone arsenal in Alabama, is working for his master's degree.

Paul Brown works as a facilities engineer for DEC in Westminster, MA. Last year, he received his MBA from WPI.

Steven Buba is a sales representative for United Restaurant Equipment Co., North Smithfield, RI.

Robert DiGennaro holds the post of engineering supervisor at GTE Spacenet in McLean, VA.

Rick Garagliano is a senior project engineer at Dynachem Corp., Irvine, CA.

Dr. **John Goulet** has been promoted to associate professor at Thomas College in Maine. Before joining Thomas in 1983, he had been an assistant professor at Colby College since 1976. With a PhD from RPI, he is involved with computer science and mathematics.

John Homko serves as a senior development engineer at Pencept Inc. in Waltham, MA.

Currently, **Terrence Luddy** works as a spe-

Reunion '84: The Class of 1944 members.

cial agent for the FBI in New Haven, CT. He has a JD from Western New England College School of Law, Springfield, MA.

Donald Moquin is a senior structural engineer at Canam Steel Corp., Needham, MA.

David Pouliot is a principal engineer for Lockheed Electronics.

Richard Sargent is a senior project engineer with Allis-Chalmers Corp., Cambridge, MA.

Gary Smolen is employed as an associate engineer by Northeast Utilities in Hartford, CT.

John Taylor now works for Integrated Industrial Systems in Wallingford, CT.

1974

Reunion **September 22, 1984**

BORN: to **Charles** and **Anne McPartland Dodd, '75,** their second daughter, Laura, last December. Emily is now three. . . .to Diane and **Michael Kozakiewicz** a son, Brian, on May 22, 1983.

Gary Bellinger is a senior chemical engineer at Waters Associates in Milford, MA.

Last winter, performer **Steve Dacri** appeared at the Magic Castle in Hollywood. This summer he is slated to appear in Dallas and Boston, and next fall in New York and Las Vegas.

James Briggs works as design manager at Naval Facilities Engineering Command, Philadelphia. He is a registered professional engineer in Connecticut.

In March, **Gene DeJackome** ran unopposed for a third term as selectman in Orange, MA. Currently, he is manufacturing supervisor at Monsanto in Springfield. He belongs to the Kiwanis and the Knights of Columbus.

Lawrence Hayden is now a senior software programmer at Pfizer Co., Groton, CT. He is also an instructor of data processing and a computer programmer at Connecticut College and Thames Valley Regional Technical College.

Gerald Masi recently became vice president of Westpac Shelter Corp., Santa Barbara, CA.

William Murwin is a senior data communications specialist at State Mutual in Worcester.

Kevin Naughton works for Main Engineering in Boston.

Craig Tyler continues as a military sales engineer for Times Fiber Communications, Wallingford, CT.

Gary Velozo holds the post of general supervisor at Polaroid Corp., Norwood, MA.

David Washburn serves as an environmental engineer for the U.S. Fish and Wildlife Service in Newton, MA.

1975

MARRIED: Richard Bloom and Linda Ann Bergantini in Providence, RI, on April 8, 1984. She graduated from Katharine Gibbs, attended Providence College and is manager of word processing at Fleet National Bank in Providence. He is president of Independent Glass Co.

Mark Antonio recently received his PhD in chemistry from Michigan State University, East Lansing. He also has an MS from Fairleigh Dickinson University, Madison, NJ. A chemical engineer with Sohio Research Center, Cleveland, OH, he belongs to the ACS and is co-author of several papers published in professional journals.

Erik Brodin is supervisor of industrial engineering at General Motors in Norwood, OH.

Bradley Coleman serves as a senior process engineer at Fluor Engineers in Irvine, CA.

Charles Embree holds the post of manager of the Northeast area field service at Brown Boveri Electric in Middletown, CT.

Edward Greenebaum, with two former colleagues from Huth Engineers, has become a partner in GMZ Associates, an engineering firm in Lancaster, PA. The three believe their firm is unique because it combines structural and civil engineering with landscaping. Greenebaum has worked as a structural engineer, specializing in building and bridge design. He also has a geography degree from Clark.

Maureen and **Fred Greulich** and their baby, Lindsey, reside in Endwell, NY. Fred is training for the position of plant product manager at Frito-Lay's Kirkwood, NY, plant.

Steven Harvey holds the post of municipal bond analyst at Standard & Poor's Corp., New York City.

George Hill is a senior systems programmer for Access Technology in South Natick, MA.

Christopher Keenan is a staff engineer at Exxon Chemical Co. in Linden, NJ. He, his wife, Donna, and their child live in Clinton.

Robert Murray works as a senior mechanical design and development engineer for Raytheon in Sudbury, MA.

Capt. **Michael Parker** (USA) has assumed command of Company B, 123rd Maintenance Battalion, 1st Armored Division, Fuerth, West Germany. Previously, he was at Fort Hood, TX.

Capt. **Douglas Sargent** has been decorated with the U.S. Air Force Commendation Medal at Thule Air Base in Greenland. He serves as chief of programs and engineering with the 1012th Air Base Group.

Mike White continues as a research metallurgist for Pfizer in Wallingford, CT. He resides in Hamden.

1976

MARRIED: Loretta Deming and Robert Goeller III on December 31, 1983, in Glastonbury, CT. A project engineer at Clairol Appliances, Stamford, CT, she has an MSME from MIT. Goeller graduated from St. Lawrence University and serves as a senior project manager at Hatzel and Buehler Inc., Stamford. . . .**Charles Putnam** to Andrea Olsen in Connecticut on February 4, 1984. A registered nurse at St. Joseph Hospital, Stamford, Andrea graduated from Southern Connecticut State College. Charles is a senior engineer with Davis and Geck in Danbury.

BORN: to Ellen and **Michael Menesale** a daughter, Megan. Twin daughters, Ann and Sara, are now three. After seven years with U.S. Steel, Michael is now a technical manager with Loos & Co. Inc., Pomfret, CT. The firm is involved with aircraft cable and wire rope.

David Altieri writes: "After visiting Seoul, Korea, on an assignment for Honeywell, I visited Japan and Hawaii."

Stephen Anstey is a field engineer for GE Ordnance Systems, Cape Canaveral, FL.

David Berry is currently an engineering student at Cape Cod Community College in Barnstable, MA.

Formerly with *The Call* circulation department, **Richard Chamberlin** was recently named a patrolman with the Woonsocket, RI, police department. Besides WPI, he attended the University of Rhode Island.

No longer with Allan H. Swanson Inc., **Robert Cormier** and an associate have started a new firm, Cuoco & Cormier Inc., civil engineers and land surveyors, in Nashua, NH.

Jeff Gravdahl is treasurer of A. Moe & Co. Inc., Philadelphia.

Constance Kuzmier is a management consultant with Rath & Strong, Lexington, MA.

Reunion 84: Al Swetz, '59, with Marlene and Robert Bober, '59.

Craig Plourde has been elected vice president of the Connecticut Bank and Trust Company, Hartford, CT. He joined the bank in 1976 as a senior programmer and was later made a senior systems engineer. In 1981, he was appointed teleprocessing project leader, and more recently he became manager of teleprocessing software support.

Robert Winter is district manager for Raymond International Builders in Westville, NJ.

1977

BORN: to Mr. and Mrs. **Christopher Baker** their first child, Rachel Ann, on November 20, 1983. . . .to Robert and **Mary Hainsworth Hickey** their second child, Alice Frances, on January 30, 1984. Robert is a project officer in the Economic Development Administration. Mary is on leave of absence from ARCO Chemical, where she is employed as a development engineer.

Bruce Baran, who recently received his PhD in physics from Northeastern, currently works for Adaptive Optics Associates in Cambridge, MA. His wife, **Carol Sigel Baran,** is a systems engineer for Higher Order in Cambridge.

Richard Blauvelt now works as regional sales manager for the Ron Beckett Agency in Lynn, MA. Last November, he resigned from True Trace in Whittier, CA, to return to New England.

David Bolin works for Hoffman-LaRoche, Nutley, NJ.

James Buffi has a new post as marketing engineer with Texas Instruments in Attleboro, MA. Last year, he received his MBA from Bryant College in Smithfield, RI.

Marc Gantman, who received his MBA from Wharton in 1982, is currently a management consultant with the BDM Corporation in McLean, VA.

Domenico Grasso is in the PhD program in environmental engineering at the University of Michigan. His wife, Patty, is a pediatric resident at the university's Mott Children's Hospital.

Tom Grautski holds the post of manager of materials control at Estee Lauder in Melville, NY. He and his wife, Andrea, reside in Ronkonkoma.

Jon Hammarstrom is director of quality assurance, U.S. operations, for Rodime Inc. in Boca Raton, FL.

Kevin Healey works for Carlson Group Inc. in Cochituate, MA. He and Christine and their two children reside in Bridgewater.

Mark Jankins is now an assistant professor at the College of Charleston (SC). Last year, he received his PhD from the University of Maryland.

Roger Lemos serves as a consulting engineer for Energy Planning and Management, Framingham, MA.

Richard Mazmanian recently joined Mott Associates in Towson, MD.

Stuart Merrell is employed as a design and estimating engineer at Reisner Metals in South Gate, CA.

Joseph Miceli works as a research scientist at Kodak in Rochester, NY. He received his PhD in optics from the University of Rochester last year.

Paul Murphy, a medical student at Tufts College of Medicine, recently took courses in physical diagnostic medicine at Falmouth (MA) Hospital.

In January, **John Osowski** took over a new post as process engineer at Mobil's manufacturing facility in Jacksonville, IL.

Recently, **Mark Popham** was named a project engineer in the environmental division of Anderson-Nichols & Co., Clinton, MA. A registered sanitarian, he is on the board of directors of Millers River Watershed Council. Mark, his wife, Brenda, and two children, Andrew, 3, and Sarah, 1, reside in Orange.

Mark Puputti is in charge of mechanical design for new products at Gilbert Engineering, Phoenix, AZ. He and his wife, **Brenda Boucher-Puputti, '80,** reside in Mesa.

Marc Richard is a senior engineer with Linkabit Inc. in Lexington, MA. He has an MSEE from MIT.

Rick Seidnitzer works for Donald J. Pilon in Springfield, MA.

Fred Sowa is a packaging machinery manager with Chesebrough-Ponds in Clinton, CT.

Christin Walker, who serves as an application engineer for GE in Pittsfield, MA, has an MSME from RPI.

1978

MARRIED: Bryce Granger to Rosemary McKinley on August 27, 1983, in Worcester . . . .**John Kuchachik** and Cheryl Peltier on June 11, 1983. Cheryl, executive secretary to the vice president of Wintex Inc., Waltham, is a Becker graduate. John has a new job as data center facilities manager at Fidelity Investments in Boston. The Kuchachiks reside in Ashland.

BORN: to Mr. and Mrs. **John DiBiasi** a son, John Edward, on January 9, 1984. . . .to Mr. and Mrs. **David Fisher** a daughter, Katherine Irene, on October 6, 1983. . . .to **William** and **Patricia Tracy Walton** a son, William Tracy, on June 29, 1983.

John Anderson serves as a senior software engineer at Technicare Corp. in Solon, OH.

Jerry Bujaucius is now a senior production engineer (flight controls division) for Chandler Evans of West Hartford, CT. He continues as professor of manufacturing engineering technology at Hartford State Technical College.

William Gagne is an operations specialist for Metcalf & Eddy in Boston. He has an MSCE from WPI.

In January, **Gilberto Gonzalez** was named quality assurance engineer for Goodyear in Valencia, Venezuela. Previously, he had been a project engineer for Colgate-Palmolive.

Peter Hayden holds the post of national accounts sales manager for AT&T in Columbus, OH.

Daniel Jackson is a graduate student and research assistant in the EE department at the University of Illinois in Urbana.

August Jasminski works as a project engineer for Gilbane Building Co. in Providence, RI.

Lamin Jobe is principal engineer for the Department of Water Resources in Banjul, the Gambia. He received an MS from Cornell in 1982.

Dennis Kelly is a senior mechanical engineer at Bechtel, Gaithersburg, MD.

Making a Pitch For the Majors

Pouring it on

"Aspiring pitchers are like actors," says Paul Josephson, '77 CE. "They have to be seen at the right time by the right people in order to get ahead."

Josephson, who is with the Atlanta Braves' farm club this year, and who was previously with Oakland, Detroit and Montreal clubs, enjoys being in a highly competitive field. He likes the pressure.

"I'm a short-relief pitcher," he explains. "They call me in late in the game because I usually have good control in tough situations."

During the five-month season, Josephson warms up or pitches almost every day. "I usually play in 50 to 60 out of 140 games," he says. "The team stays in motels paid for by the club during spring training, but when the season starts, we pay for our own lodging and food when not on the road. We travel in chartered buses and don't usually make overnight stops. In the Southern League, that can mean a 16-hour bus trip one way!" Occasionally, if the distance is too great, or if games are scheduled too close together, the team flies.

Having played in different parts of the U.S., Josephson says he prefers the New England climate because of the change of seasons. (He's a resident of Shrewsbury, MA.) "It's too hot in Florida," he says, "particularly in the summer." One thing he does like about the South is southern cooking. "It's especially good in Memphis and Phoenix."

After the season is over, Josephson goes back to Shrewsbury and works for Drake Associates, a firm concerned with surveying and construction. "I like to keep my hand in engineering." In fact, he's looking into the possibility of taking an MBA or computer correspondence course, so he can study even when he's on the road.

Meanwhile, he pitches between March and September. "I'm not getting rich," he admits. But there's always the chance that the right person will see him on the right day and he'll get the chance to live his dream—playing major league baseball.

Michele Mass is vice president of I. Mass & Sons in New York City.

Kevin O'Donnell works as a research scientist for Kodak Research Labs, Rochester, NY. Last year, he received his PhD from the University of Rochester.

Robert Rossier is an environmental systems engineer at Electric Boat in Groton, CT. He holds an MS in ocean engineering from URI.

John Roumas is a member of the technical staff at RCA in Burlington, MA.

Clifford Schulze is in contract sales at Grinnell Fire Protection, Canton, MA. He and his wife, **Sharon, '80,** have two children and reside in Bridgewater.

Gary Sowyrda is a supervisor with Exxon Co. USA in Tyler, TX.

Doreen Woodman Taylor works as a technical marketing representative at Hewlett-Packard in Waltham, MA.

Stephen Tourigny is a senior process development engineer at Norton Co. in Worcester.

Craig Vickery currently works as instrumentation development engineer in the electro-optics group at Pratt & Whitney Aircraft, East Hartford, CT.

Ricardo Wever writes, "Regards from Aruba." Currently, he is a control application engineer for Lago Oil & Transport Co., in Sanicolas.

Wayne Wnuck, who is with Consultants & Designers, East Hartford, CT, is a consulting engineer for UTC's power systems division in South Windsor.

1979

Reunion **September 22, 1984**

MARRIED: Don Griglack and Sherylann Kozel in Danbury, CT, in January of 1983. Sherylann, a teacher, is a graduate of Western Connecticut State College. The couple resides in New Orleans. . . .**Kevin Hughes** and Patricia Ferron in Worcester on October 1, 1983. Patricia graduated from Becker and is a dental assistant. Kevin serves as a systems programmer for CVS in Woonsocket.

BORN: to Cheryl and **Daniel Hurst** a son, Jeffrey Daniel, on February 2, 1984. Dan has transferred to the engineering division at Kodak.

John Bourassa now works for United Industrial/AAI Corp./AAI Engineering Inc.

Iginio Capaldo is employed by Mevenca in Venezuela.

Recently, **Vance Carter** was reassigned to Kamishaly, Syria, with Schlumberger Overseas S.A. Previously, he was located in Turkey.

Gary Doyle serves as a senior associate engineer at IBM in Essex Junction, VT.

Fred Fisher is an engineer I for DEC in Maynard, MA. He has an MSCS from UConn.

Stephen Fisk is a mechanical coordinator and field engineer for Daniel O'Connell's Sons in Holyoke, MA.

Javier Frances is the self-employed president of a firm in San Salvador, El Salvador.

John Grimwade works as a field engineer for Babcock & Wilcox in Chicago.

Christopher Harkins is a senior development engineer for Kodak in Rochester, NY. He and his wife, Patricia, have two children and live in Hilton.

Mohammad-Hoghooghi is a consulting engineer and project director with Iran Generation and Transmission Company in Tehran.

Kilmer Joyce works for Harris Graphics in Dover, NH.

Daniel Kennefick is employed as a maintenance engineer at Du Pont in Louisville, KY.

Lawrence Leduc works as a process control supervisor for Georgia-Pacific in Painesville, OH.

Veronique Leproux is a research engineer with Rhone-Poulens Recherches in Antony, France.

Kathleen McKeon is a graduate assistant in

the math department at Michigan State University in East Lansing. She received her MSMA from MSU in 1981.

Currently, **Peter Nelson** serves as manager of information systems for the Massachusetts Department of Revenue in Cambridge, MA. He received his master's in regional planning from UMass in 1982.

Dick Perry was supervisor of the Torrington Co. production team that took handmade prototypes of the Atari Trak-Ball unit to high-volume production, making the units available for the year-end holiday selling season. Dick is with Torrington's new precision components division.

Ronald Salett serves as a principal engineer for DEC in Maynard, MA. He and Donna have two children and live in Framingham.

Dave and **Joyce Poulton Sheridan** moved back to the USA in June of '83 following three years in Italy. Dave resigned his Army commission and now works for Isotronics Inc., New Bedford, MA. He says he does "trouble-shooting" and works with R&D and engineering in the production of hermetic hybrid circuit packages. Joyce is again a weapons system analyst for Vitro Corporation in Newport, RI.

George Tompsett is a project manufacturing engineer for Hamilton Standard in Windsor Locks, CT.

Kathy Fitzgerald Warburton works as a systems engineer for Motorola in Englewood, CO.

Allen Zubatkin holds the post of manager of materials (quality assurance) at Gould in Andover, MA.

Reunion '84: Diran Deranian, Pete Dobie and Hal Pierce, all '29.

Reunion '84: Russ Wiley, '29, and Carl Carlson, '29.

1980

MARRIED: Thomas Lewis to Cynthia Copeland in Litchfield, CT, on December 23, 1983. Cynthia graduated from Smith College and is editor of a children's magazine for Quinn Publishing, Springfield, MA. Tom has been studying for his PhD in chemistry at MIT. . . . **Robert Oriol** to Christa Lauridsen in Greenwich, CT, on March 31, 1984. Christa graduated from Middlebury College and is a senior software consultant for Manufacturer's Business Systems, Worcester. Robert is a project leader at Boston Systems Office. . . . **Michael Parulis** and **Margaret Newcomb, '82,** on October 30, 1983, in Auburn, MA. Margaret is a cost engineer for Stone & Webster's Millstone III nuclear power plant in Waterford, and Michael works for General Dynamics-Electric Boat in Groton, CT . . . .**John Wilbur** and Deborah Ivanoski in Quincy, MA. She graduated from Laboure Junior College and is on the nursing staff at Brockton Hospital. He is a planning supervisor for GE in Lynn.

John Apostolou serves as sales and development representative for Du Pont in Nashville, TN.

Allison Avery works as a support engineer for Stone & Webster, Boston.

Verne Backus is a process-product engineer for Sprague Electric in Barre, VT.

Louis Bernasconi is vice president of Automatic Test Equipment Service, Nashua, NH.

Robert Blake, who works as a market research analyst for United Illuminating Co., New Haven, CT, is also studying for his MBA at the University of New Haven.

William Emmet II serves as an analytical engineer at Norden Systems, Norwalk, CT. Last year, he received his MS from Cornell.

Gary Fischer is on the technical staff of AT&T Bell Labs in North Andover, MA.

Richard Goldman has been named as legislative aide to State Senator George Gunther of Stratford, CT. In the summers of 1981 and 1982 he had served the senator as a research assistant.

Edward Johnson is a district sales engineer for Torrington Co., Indianapolis, IN.

Robert Kennedy is a program leader for Westinghouse Electric in Orlando, FL.

Gregory Knese is purchasing manager at Henry Knese Inc., College Point, NY.

Stephen Lawry, whose promotion to Captain, USAF, becomes effective in August, will be moving to a new assignment as AFROTC instructor in Philadelphia. Last year, he was selected as "Outstanding Company Grade Officer of the Year" at the Air Force Weapons Laboratory.

Joseph LeBlanc is scheduled to receive his PhD in chemical engineering from the University of Massachusetts in December.

Peter Leonard works as a design engineer for KG Engineering in Woonsocket, RI.

Karen Liukkonen has been promoted to specialist I, for investments, money market operations, treasury and financial services, at John Hancock Mutual Life Insurance Co. In her new post, she is responsible for daily short-term investment decisions and credit analysis of investment alternatives. She joined the firm in 1982 as a credit analyst in money market operations and has a master's degree in finance from Babson.

Michael R. Lombardi continues as an assistant project engineer for Stone & Webster Engineering, Boston. He and his wife, Susan, a graduate of Providence College, currently reside in Manorville, NY.

Raymond Lucchetti, Jr. has joined Digitech Industries, Ridgefield, CT, as a senior technical sales specialist. He is responsible for supporting all international distributors and will assist the domestic sales operations in system sales, design custom software packages and contribute to new product development. Previously, he was a staff engineer at Bunker Ramo Information Systems, banking terminal systems.

Deborah Luper, a development engineer for Western Electric, Allentown (PA) works, was a co-author of "Automatic Plating of Bipolar Integrated Circuits," which was published in the January issue of *Plating and Surface Finishing.*

William Mangano is a systems analyst at State Mutual in Worcester.

In May, **Brian McCarthy** graduated from SUNY-Downstate Medical School in Brooklyn, NY. He is now with the Department of Orthopedic Surgery at Albert Einstein College of Medicine.

Matthew McSherry works for Newport News Industries, Newport News, VA.

John Noonan, a project engineer at SSV&K Consulting Engineering in Stratford, CT, is also studying for his MBA evenings at UConn.

Rosemary Murphy O'Brien is working for her MS in chemical engineering at Tufts.

Brenda Boucher-Puputti is a member of the

Reunion '84: Carl Hammarstrom and Charlie Frary, both '34.

technical staff at GTE Laboratories in Tempe, AZ.

Paolo Rambelli is a patent agent with Jacobacci-Casetta & Perdni in Torino, Italy.

Clifford Read is a product support engineer at Foxboro (MA) Co.

Doreen Sa Vieira serves as a microlithography applications engineer at Perkin Elmer, Wilton, CT.

Keith Sylvestre works for Northeast Utilities, Enfield, CT.

No longer with the Army, **George Tobin** is now performing consulting work for project managers at Semcor Inc. in Farmingdale, NJ. He's also been writing restaurant reviews for local newspapers and is working for his MBA at Monmouth College.

Chuong Vu is a software designer for Microcom Inc., Norwood, MA.

James Warner, who holds an MSCS from WPI, has been named vice president of Cortex Corp., Wellesley, MA. He started with the company in 1978 and later became principal designer and developer of application packages. Previously, he was senior analyst at United Computing Systems and project analyst at Honeywell Information Systems. Cortex Corp. develops software productivity tools for users of DEC hardware.

John Whiteside is a consulting engineer for DEC in Nashua, NH. He has a PhD from the University of Rochester and a BA from Brown, as well as a master's from WPI.

Raymond Yando teaches mathematics at Ludlow (MA) High School.

Elaine O'Neil Yarnell has been promoted from new-products coordinator to department head of packaging in the oxidation department at Clairol in Stamford, CT.

Michael Yevak serves as a new product engineer at Texas Instruments in Attleboro, MA.

1981

BORN: to Valerie and **Raymond Aubert** their first child, Ryan Michael, on February 23, 1984. Raymond continues as a mechanical design engineer for the transmission group at GE Ordnance Systems in Pittsfield, MA.

Alan Amaral is a software engineer for Sanders Associates in Nashua, NH.

George Bernota, a field engineer with Schlumberger Technical Services, Singapore, is now working for the firm in Bombay, India, at Sanghi Motors.

Gary Brown serves as supervisor of manufacturing at Allied Corp., Hopewell, VA.

Randy Byrne holds the post of product manager at Haake-Buchler in Saddlebrook, NJ.

William Carlson, who received his MSEE from Purdue in December, is now working for his PhD.

Eleanor Cromwick serves as assistant engineer for Turner Construction, Boston.

Michael Di Costanzo is currently with Union Oil Company's process development group working on Union's shale oil process. He is located in Fullerton, CA.

Phil Gallagher continues as foreman at General Dynamics-Electric Boat in Groton, CT.

Joseph Gianetti manages customer contact for Commonwealth Gas Co. in Southboro, MA.

Mary Goodrow works as a manufacturing engineer at Data General Corp., Milford, MA.

Anestis Halkidis is with Atex in Bedford, MA.

Richmond Harris serves as a senior project engineer at Stride Rite Corp., Cambridge, MA.

Donald Howard is a project engineer for Hamilton Test Systems in Windsor, CT. He and Karen have one child and live in Longmeadow.

Russell Ingalls works as a field engineer for Westinghouse at the Portsmouth (NH) Naval Shipyard.

Robert Leonard holds the post of director of research at P.A. Hunt Chemical Corp., East Providence, RI.

Joseph Lino is with Charles L. Lino Associates, Clifton Park, NY.

Glen Martin is a supervisor at USCI in Billerica, MA.

Michael Morang has been promoted to senior systems analyst within the systems organization at State Mutual in Worcester. He joined the firm as a systems analyst in 1981.

Anthony Napikoski continues as assistant engineer at United Illuminating in New Haven, CT.

Joseph Norman III serves as an account executive with Merrill Lynch Pierce Fenner & Smith in Lawrenceville, NJ.

David Normen is employed as an analytical engineer at Hamilton Standard in Farmington, CT.

Robert Oftring is treasurer of Oftring & Co. in Worcester.

Judith Paquette is an analytical engineer at Hamilton Standard in Farmington, CT.

Rick Passaro works as a sales engineer for Eaton/Cutler-Hammer, Farmington, CT. He sells electrical and electronic motor controls in Massachusetts and Connecticut.

Marylou Place holds the post of assistant to the vice president of engineering at Ade Corporation, Newton, MA. She resides in Cambridge.

Stephen Russo works for Automatix, Billerica, MA. He resides in Bedford.

Joseph Schomaker is a field service engineer with Westinghouse in Hartford, CT.

Robert Segarra is an industrial engineer with Chesebrough-Ponds, Oriskany Falls, NY.

James Shannon serves as a field engineer at Hughes Aircraft Co., Fullerton, CA.

Greg Stanford has completed his MSCE at Carnegie-Mellon, Pittsburgh, and is now a structural engineer for Greiner Engineering in Baltimore, MD.

Brian Stoffers serves as a senior R&D engineer at Xyolgics in Burlington, MA.

Adage Inc., manufacturer of color raster and vector refresh computer graphics work stations, has appointed **Jeffrey Wade** sales engineer for the Western region. In his new post, he is responsible for serving accounts in the Los Angeles area and Orange County, CA. Since 1981, he has been a product specialist with Adage. He belongs to the IEEE.

Andre Walker is a junior chemical engineer with Duracell Inc., Norcross, GA. He and his wife, **Anne Caulfield-Walker, '82,** reside in Stone Mountain.

Mati Weiderpass works in the general staff headquarters of the major command responsible for the deployment of the Pershing II missile system. During his free time, he is working on his master's degree through Boston University. He writes: "I also frequent the Austrian and

Reunion '84: Roy Iffland, '39, with Don Berth, '57, '59, who is WPI Vice President, University Relations.

Swiss slopes for ski adventures and look forward to sharing some of those adventures with other alumni. Most recently, I attended the Winter Olympics in Sarajevo."

Catherine Girouard Wilson, who is pursuing her MBA at Arizona State University, is a supplier quality engineer for Motorola in Scottsdale, AZ.

John Wilson is now working at Du Pont's Savannah River plant in Aiken, SC. He and his wife, Robin, have two children and live in North Augusta.

Lt. **Katherine Coghlan Wurm** is stationed at Hanscom AFB, MA.

1982

MARRIED: Michael Iassogna and Linda Patavino on September 24, 1983, in Bridgeport, CT. Linda graduated from Fairfield University and is an accountant with Du Pont in Wilmington, DE, where Mike is a project engineer. . . .**Thomas Potter** to Jeanne Young on March 17, 1984, in Taunton, MA. Jeanne graduated from Dean Jr. College, Franklin, MA, and is a medical assistant. Tom is with the U.S. Navy's nuclear submarine program. . . .**John Tirrell** and Anne O'Loughlin in East Weymouth, MA. Anne graduated from Quincy Junior College. John is with Stone & Webster.

Thomas Amoruso is a project engineer with Addressograph/Farrington in Hudson, MA.

Luis Anez is transportation supervisor for Lagoven. He resides with his wife, Anabella, in Caracas, Venezuela.

Sean Anzuoni works on large optical systems at Itek Corp., Lexington, MA.

Robert Arnold is a math teacher at Gorton Junior High School in Warwick, RI.

Paul Atkinson works as an assistant engineer for Northeast Nuclear Engineering Co., Waterford, CT. He is located at the Millstone III nuclear power plant in the start-up engineering department.

James and **Joyce Trela Auman** continue with Hamilton Standard, Windsor Locks, CT, where he is an analysis engineer and she is a project engineer.

Anni Autio is now a word processor/engineer with Chas. T. Main.

Kenneth Beck is self-employed with Acupac Packaging in Mahwah, NJ. He started the firm, which is a contract packager of cosmetic pharmaceutical products, in 1982.

Scott Berry is a graduate research assistant at George Washington University/NASA in Hampton, VA.

Michael Bickford works for Westinghouse Electric and is located in Amherst, NY.

Timothy Brennan is with the Naval Ordnance Station in Indian Head, MD.

Kingsley Brown serves as a power systems engineer with McGraw Edison Co. in Canonsburg, PA.

Scott Brown is a manufacturing engineer with Raytheon in Waltham, MA.

Thomas Brucker is an associate programmer for IBM in Kingston, NY.

Edward Canfield works for IBM in Poughkeepsie, NY.

Phillip Collingwood holds the post of production manager at Guilford Gravure Corp., Green Cove Springs, FL.

John Corey serves as a software development engineer at Hewlett-Packard in Cupertino, CA.

Ernest Cormier is the self-employed president of Nicacia Software in Stamford, CT. The company designs and programs game and educational software.

Charles Coward III serves as a junior development engineer at AMP Inc. in Harrisburg, PA.

Lt. **Cory Cronan** is an analysis officer with the U.S. Army at White Sands Missile Range, NM.

Terry Crook serves as an electronic systems service engineer for Hamilton Standard, Windsor Locks, CT. She is also working on her MS in engineering management at Western New England College.

Lawrence Donohue is an industrial engineer for Stanhome in Easthampton, MA.

James Dorsey works as an associate engineer for Codex Corp., Mansfield, MA.

Gregory Doyle is a highway engineer with the Federal Highway Administration in Trenton, NJ.

Leon Droby works for New York Telephone in New York City.

Richard Ferron is now with the research and development division of Babcock and Wilcox Co. He is located in Alliance, OH.

Douglas Frey is a resident officer in charge of construction contracts for the U.S. Navy.

Majid Ghamami is a chemical engineer for the Khorasson Regional Water Authority in Iran. He has an MBA from AIC.

David Gillespie works for United Illuminating Co., New Haven, CT.

Robert Godiksen works as a sales engineer for L. B. Swan Assoc., Hartford, CT.

Currently, **Paula Green** serves as a market development engineer at Union Carbide's Linde Division in Tarrytown, NY.

Louis Greuling is employed as a field engineer by Pullman Power Products of Avila Beach, CA.

Gerard Grippo works for General Dynamics in Quincy, MA.

Deborah Gustafson has relocated with Digital Equipment Corp. to New Hampshire.

Robert Houlihan is an electrical construction engineer with Stone & Webster in Waterford, CT.

Paul Howard is a project engineer with Anderson-Nichols & Co. in Clinton, MA. He and his wife, Michele, have one child and live in Holden.

Richard Hudson serves as an assistant construction coordinator with Camp, Dresser & McKee, Boston.

Last year, **Florencio Icaza,** who resides in Panama, was promoted to chief engineer of IRHE's thermoelectric power plant.

Bradley Jarvis, who works for Raytheon in Northboro, MA, is also associated with Methographics Research Corp., Bedford, MA.

Douglas Jones is a member of the technical staff at Bell Labs in Holmdel, NJ.

Jeffrey Kern works as a systems designer for Singer-Kearfott, Wayne, NJ.

Michael LaFleur is now an electronic engineer designing fiber systems at Kelco Fiber Optics in Norwood, MA.

Thomas Malin serves as a design and development engineer for Raytheon in Sudbury, MA.

Douglas Melanson serves as a systems engineer at IBM, Milwaukee, WI.

Stephen Morgan works as a systems analyst at Pratt & Whitney Aircraft, Columbus, GA.

Dan Multer works for Communication Concepts in Branford, CT.

Thomas Nicolosi holds the post of process engineer at MACOM PHI in Torrance, CA.

Glenn Oakley is a structural engineer at Dewberry & Davis, Fairfax, VA.

Guy Osborne serves as quality assurance engineer at Lacey Mfg. Co. in Bridgeport, CT.

Steven Oxman is a computer scientist for NATO/USA group.

Richard Petrucci, a designer for Stone & Webster, Boston, is currently working at a nuclear power station in Waterford, CT.

Fred Roys is slated to move to Andersen AFB, Guam, in August, where he will fly B-52s.

Randall Rubinstein is a manufacturing engineer with Hottinger Baldwin Measurements in Framingham, MA. He has an MBA from WPI.

Bahman Sahba is an engineer and supervisor of R&D at Posi-Seal International in North Stonington, CT. He is also an engineering consultant. He has an MSME from WPI.

Arne Salonen is employed as a city planner by Gillespie-Delorenzo in San Diego, CA.

Charles Santore has been serving as an engineering aide with the Department of Public Works in Stamford, CT, and studying for his MSCS at Pace University, White Plains, NY.

David Schedin holds the post of product sales engineer at Teradyne Connection Systems Inc. in Nashua, NH. He and his wife, Nina, reside in Hollis.

Ingrid Slembek continues with DEC in Littleton, MA, and is working for her MSCS at WPI.

Jan Sorensen is involved with independent machine sales in Copenhagen.

Wolfgang Strobel is product manager for Gerber Scientific Products, Manchester, CT.

Liz Sydney is assistant analyst in the maintenance and construction department for New England Power Service in Westboro, MA.

Carsten Thomassen works as a management consultant at Arthur Andersen & Co., Copenhagen, Denmark.

George Valaitis works for IBM in Owego, NY.

Thomas Villani is a student at the University of Connecticut School of Dental Medicine.

Peter Yee is on the technical staff at Hughes Aircraft in El Segundo, CA.

"Thread Gourd—Darn Carefully!"

If most mechanical engineers told you that gourds were once used for darning stockings, you'd think they were pulling your leg. If Howard Atkins, '34 ME, tells you that, you'd better listen. Atkins is not what you'd call an average ME. He's what you'd call an extraordinary farmer-entrepreneur. And he knows his gourds!

"My apples, too," he laughs. His 600-acre Bay Road Fruit Farm in South Amherst, MA, produces more than 100,000 bushels of apples annually.

Another important crop is pumpkins. "There are two major types of pumpkins," Atkins explains. "The sugar variety, which is for pies, and the Halloween variety, which is larger, coarser and more suitable for decoration."

Along with the apples and pumpkins, he grows peaches and pears, all of which are sold through his own retail store, Atkins Farm Fruit Bowl. "And a few years ago," he reports, "we added a baking facility."

Atkins's "we" is not editorial. His sons, Dale and Dan, represent the fourth generation of Atkins fruit farm producers. Back in 1887, Howard's grandfather, George, bought an orchard with 100 trees. In 1952, the third generation (Howard) took over the operation, progressively increasing his orchards.

In 1970, Atkins was elected to the board of directors of Agway Inc., a farmers' cooperative, in a district covering the states of Connecticut, Massachusetts and Rhode Island. "My greatest honor," he says. He was also elected to the board of Curtice-Burns, a food processing corporation. The two organizations do about $900 million worth of business annually.

Howard Atkins and his wife, Ruth, have partially retired to their all-season home in Sugar Hill, NH. But full retirement is not in the cards. Each year Howard increases his orchard acreage. "I love the land," he says.

Photo courtesy of The James Library Inc.

Howard Atkins, '34 ME

1983

MARRIED: Daniel Fretz and Roberta Dion in Norfolk, MA, on March 17, 1984. Roberta graduated from Worcester State College and is a cartographer. Dan works for RCA Automative Systems. . . .**Roger Sacilotto** and Susan Woodyard on April 15, 1984, in Danvers, MA. Susan, who graduated from Marion Court Secretarial School, Boston, is a secretary at Massachusetts Computers Associates Inc., Wakefield, where Roger is a systems engineer. . . .**Edward Walls, Jr.** to Andrea Statile in Woodbridge, NJ, on October 29, 1983. Andrea graduated from the University of Delaware and is an account coordinator with MED Communications in Woodbridge. Edward is a chemical technician at Arkay Research Center in Randolph.

Douglas Acker is studying for a PhD in chemical engineering at the University of Florida in Gainesville.

Sonia Adrianowycz continues as a chemical engineer with the U.S. Navy at Navelex in Washington, DC.

Roy Arsenault is a member of the technical staff at Rockwell International in Lakewood, CA.

John Atkinson is a staff consultant for Arthur Andersen & Co. in Hartford, CT.

Donna Bagdonovich serves as a chemical engineer with the U.S. Army Natick R&D Center, Natick, MA.

Paul Bozoian is with WPI's Alden Research Laboratory in Holden, MA.

Michael Brousseau works for Sikorsky Aircraft, Stratford, CT.

Sean Cafferty is inventory control supervisor for Lillian Vernon, Elmsford, NY.

Philip Chapnik continues as a grad student in the PhD program at the Institute of Optics at the University of Rochester.

David Crawford has been commissioned a second lieutenant in the U.S. Air Force upon graduation from Officer Training School at Lackland AFB, TX, and assigned to Randolph AFB, TX.

Janina Natrillo DeMasi continues as an electrical engineer at Sikorsky Aircraft, Stratford, CT.

James Despelteau is an associate member of the technical staff at RCA's government systems division in Burlington, MA.

Neil Dubois works for the Naval Underwater Systems Command in New London, CT.

Lt. **Jon Ericson** has completed a signal officer's basic course at the Army Signal School in Fort Gordon, GA. Recently, he was acting chief operations officer for the Signal Corps at Dugway Proving Grounds, UT. He has been associated with the Atmospheric Science Laboratory in White Sands, NM.

Pamela Fearn serves as a process engineer at ITT in Shelton, CT.

Sheryl Hess works as a junior mechanical engineer at Sikorsky Aircraft, Stratford, CT.

Timothy Horan is a second lieutenant with the U.S. Army stationed in Fisbach, West Germany.

John Janosik continues as a senior programmer at Financier Inc., Westboro, MA.

Thomas Kemeny is an associate engineer with Westinghouse Electric in Madison, PA.

Elaine Kokernak is a software engineer for DEC in Marlboro, MA.

Andrew Krassowski has been named associate systems engineer at Bristol Babcock in Waterbury, CT.

Kenneth Kubilins has been taking undergraduate pilot training with the USAF at Vance AFB, OK.

John Lynch works as a sales engineer at Fenwal in Ashland, MA.

Kenneth McFall holds the post of area manager at NE Chemical Co., Merrimack, NH.

Keith Messier is employed as an advanced manufacturing engineer with GE in Erie, PA.

John Moore is studying for his MSME at RPI.

Stephen Nevalsky has accepted an electrical-design engineering post at Texas Instruments in Lewisville, TX.

Christine O'Connor serves as associate engineer at Raytheon, Waltham, MA.

Leslie Rooney is employed as a junior chemist at Herbert & Schuster in Quincy, MA.

Alan Rosenberg is an airframe engineer at Sikorsky Aircraft, Stratford, CT.

Carol Schober is a systems programmer analyst with Pratt & Whitney in East Hartford, CT.

Richard Scott serves as a process and development engineer at UNC Naval Products Division, Uncasville, CT.

Tim Scott works as a scientific analyst at Xon Tech, Van Nuys, CA.

Stephen Smith is a components engineer in GE's ordnance division, Pittsfield, MA.

Donald Soubie works as a development engineer at the U.S. Army Chemical Research & Development Center, Aberdeen Proving Grounds, MD.

Wendy Stebbins is a design engineer for GE Ordnance Systems in Pittsfield, MA.

William St. John has been named marketing engineer at Hewlett-Packard Co., Colorado Springs, CO.

Richard Thomas works as a systems engineer at Singer Co., Kearfott division, in Wayne, NJ.

Christopher Trainor serves as a project engineer at Ingersoll Rand, Wichita Falls, TX.

Jeffrey Twomey is a digital systems engineer with GE in Daytona Beach, FL.

John Visbaras is a member of the professional staff at American Management Systems in Arlington, VA.

Ellen Warms serves as a system analyst at IBM in Endicott, NY.

Anne Warner is a software engineer at DEC, Nashua, NH.

Deb Weinstein works for GE in Binghamton, NY.

William Wheeler, a U.S. Navy officer, is at the Nuclear Power School in Orlando, FL.

Curtis Whitehead serves as a software engineer at DEC in Andover, MA.

Arthur Wu has been studying at RPI.

School of Industrial Management

James F. O'Regan (WPI '49, SIM '59) has been honored by WPI for professional achievement with the Albert J. Schwieger Award. He is president of Feecon Corp., Westboro, MA.

Lloyd Pote, '61, a selectman in Sturbridge, MA, since 1981, has been active in other town affairs. He has served as chairman of Sturbridge's finance committee and as a member of the town's personnel policy committee and its recreation committee. Other interests have been the United Way and the Rotary Club. He is a founder and past president of CPC Engineering Corp. . . .**Robert Kendick, '65,** is plant manager at Bay State Abrasives in North Manchester, IN. . . .In February, **Alden Jacobson, '66,** coordinator of Vermont Machine Skills Training in Springfield since 1980, gave a talk on the electronics training program before the local chapter of the International Management Council. He graduated from the University of Kentucky and retired from Cincinnati Milacron-Heald as manager of engineering following 26 years of service.

Jack Shields, '69, group manager for Digital Equipment Corp., was the guest speaker at the National Honor Society awards dinner held at St. John's High School in Shrewsbury, MA, in April. He is a graduate of the program for management development at Harvard's Graduate School of Business Administration. . . .**Carl Harris, '75,** has been appointed sales engineer for Pressmasters Inc. of Newburyport, MA, and Cheshire, CT. The firm supplies metal stamping equipment and tooling for the New England states. Harris graduated from Worcester Junior College and has completed an Applied Management Science course at UNH. Before joining Pressmasters, he worked 18 years in the tool and die industry and held managerial positions in the contract stamping and fabrication industry in Worcester and New Hampshire.

Reunion '84: William Firla, '60, Walter Bank, '46, and WPI Director of Admissions Roy Seaberg, '56 share a laugh.

Natural Science Program

Deborah Pietro Seal, '78, is manager of media distribution and computer training in the New York State Education Department Center for Learning Technologies in Albany. . . .**Martin Conway, '79,** was the commencement speaker at Granby (MA) High School. He taught math and science at the school for nine years. Also, he had served as a class advisor, drama coach, ski club advisor and chess club advisor. Currently, he teaches math at Longmeadow High School. . . .**George Radcliffe, '80,** chairman of the science department at Cathedral High School, Springfield, MA, is also a part-time instructor in the chemistry department at Elms College, Chicopee. . . .**Karen Madsen, '81,** is a chemistry teacher at Eastside Catholic High School, Bellevue, WA. . . .**Carol Andrich Mishler '83** teaches science at Reading (MA) Memorial High School.

COMPLETED CAREERS

Everett L. Bragdon, '16, died in Alden, NY, on April 4, 1984, at the age of 90. A native of Westbrook, ME, he graduated as an electrical engineer from WPI.

He spent his entire career as an electronics writer for newspapers and magazines. For 18 years, he was radio and television editor of the *New York Sun* and *New York Herald.* Also, he was trade news editor and corporate house organ editor for NBC and RCA Corporation, from which he retired in 1959. He was the author of *The Radio Amateur's Handbook.* He belonged to Theta Chi and Skull.

Max W. Tucker, '17, formerly with the U.S. Patent Office, died on November 2, 1983, in Easton, MD. A native of Washington, DC, he was born on Oct. 16, 1893. He received his BSCE from WPI.

During his career, he served with the U.S. Coast and Geodetic Survey and as a captain with the U.S. Army Cavalry in New Mexico. He joined the Patent Office as an examiner in 1919, retiring from his supervisory post on the Board of Appeals in 1955. Mr. Tucker graduated from the old Washington College of Law. He belonged to Civil War roundtable organizations in Washington and Alexandria. He was also a trustee of the Alexandria Public Library, a member of the Congregational Church and a past president of the Washington chapter of the Alumni Association. He was the father of **George K. Tucker, '51.**

Percival P. Drury, '18, died on March 16, 1984, in Seminole, FL. He was born in Spencer, MA, on Aug. 9, 1896, and received his BSCE from WPI.

During his career, he was with Turners Falls Power & Electric Co., Samuel H. Pitcher Co., Liberty Screw Products Co. and Quabaug Rubber Co. He was with the U.S. Army in 1918 and in World War II. He belonged to Tau Beta Pi.

Baalis Sanford, '20, of Holden, MA, passed away recently. A Clinton native, he was born on Jan. 26, 1899.

In 1920, he graduated as a chemist from WPI. He had been employed by Anaconda Copper Mining Co. and New England Aniline Works. For many years he worked for Norton Co., Worcester, where he had been a research chemist, superintendent of organic products and technical secretary to the works manager.

Mr. Sanford was a Mason, a former finance committee member for the Town of Holden and a past president of the Tech Old-Timers. He belonged to SAE.

Harry W. Tenney, '20, a retired administrative assistant from Westinghouse, died November 19, 1983, in Centerville, MA, at the age of 84. He was born in Leominster, MA, on April 19, 1899.

After receiving his BSEE from WPI in 1920 until 1964, when he retired as assistant to the vice president in the elevator division in Jersey City, NJ, he was with Westinghouse Electric Corp. While with the company, he was assistant director of research and received the Westinghouse Order of Merit award.

Mr. Tenney, who belonged to Sigma Xi, Tau Beta Pi and Skull, was a life member of the IEEE and was affiliated with the Rotary, the Masons, the Osterville Men's Club, the Congregational Church and the Cape Cod Horticultural Society. Formerly, he served as president of the Pittsburgh chapter of the WPI Alumni Association. He was the father of **Edwin Tenney, '59,** and **Harry Tenney, Jr., '56,** president of the Alumni Association.

Robert M. Eldred, '21, an aviation pioneer and retired aeronautical engineer for Scott Aviation, Buffalo, NY, died February 17, 1984, in Lewiston, NY, as the result of an automobile accident. He was 84.

A native of Springfield, MA, he was born on Aug. 28, 1899, and graduated as a mechanical engineer from WPI in 1921. Prior to joining Scott, he was with Bell Aircraft for many years and helped with the production of the first American jet fighter during World War II. He had also been employed by Fredric Flader Inc.

In the 1930s, he worked on aircraft design with Granville Brothers Aircraft at the old Springfield Airport. The company manufactured business, pleasure and racing planes bearing the Gee Bee insignia.

Mr. Eldred, a World War I Army veteran, belonged to ATO, the Buffalo Aero Club, the Masons and the Engineering Society of Buffalo. He was a former treasurer of the Western New York chapter of the Alumni Association.

Harland G. Foster, '21, of Collinsville, CT, died at his home on January 11, 1984.

He was born on March 5, 1899, in North Brookfield, MA. For 36 years, he was with White Laboratories in Kenilworth, NJ, from which he retired as office manager. He belonged to Phi Sigma Kappa.

Leodore E. Maynard, '22, passed away in Laconia, NH, on March 5, 1984, at the age of 86.

He was born in Putnam, CT, on July 15, 1897, and received his BSEE from WPI in 1922. For many years he was with Boston Edison Company, from which he retired in 1962. He was a member of Lambda Chi Alpha.

Clarence W. McElroy, '24, died in Concord, MA, on March 8, 1984. He was born on Sept. 3, 1902, in Chicopee Falls.

After receiving his BSEE, he joined the Boston & Maine Railroad, from which he retired as superintendent in 1967. He belonged to Lambda Chi Alpha and the New England Railroad Club. An avid soccer fan, he was a member of WPI's first soccer team.

Cmdr. **Warren P. Gleason, '26,** USNR, died at his home in Grindstone Neck, Winter Harbor, ME, on February 20, 1984. He was born in Worcester on Oct. 14, 1902, and graduated as an electrical engineer from WPI.

He was with Factory Insurance Association until 1942, when he entered the U.S. Navy. In 1946, he retired from the Navy as a full commander, but remained with the Navy as a civilian fire protection engineer in charge of the First Naval District in Boston. He retired from his civilian post in 1967.

A member of many Winter Harbor town committees, he was also a trustee of the Maine Coast Memorial Hospital. He belonged to Phi Sigma Kappa and the national and Massachusetts societies of Professional Engineers, and he was a charter member of the Society of Fire Protection Engineers.

Archie J. Horne, '26, past president of Horne & Hastings Inc., Worcester, died in Worcester on March 11, 1984, at the age of 81. Born in Scotland, he received a BSME from WPI.

During his career, he was a manager for R.C. Taylor Trust, an assessor for the City of Worcester, a development manager for W.H. Sawyer Co., a sales engineer for Chain Belt Company and Norton Co. and a mortgage officer for Worcester Federal Savings and Loan. The founder, chairman of the board and past president of Horne & Hastings, a regional brokerage and appraisal firm in Worcester, he began his real-estate career in 1933.

Mr. Horne was a past president of the New England chapter of the American Institute of Real Estate Appraisers (AIREA), as well as a former Northeast regional vice president and member of the governing council of the organization. He was awarded the Professional Recognition Award and held the MAI (Member of the Appraisal Institute) designation. An instructor with the AIREA for many years, he taught appraisal courses at Tulane, University of San Francisco, University of Wisconsin, UConn and WPI. He also taught at the Massachusetts Assessor School at UMass in Amherst. He belonged to the Society of Real Estate Appraisers and held an SREA designation.

Besides serving as a former registrar of voters in Worcester, Mr. Horne was past president of the Greater Worcester Board of Realtors. In 1967, he was named the local "Realtor of the Year." He was a past master of his Masonic lodge and belonged to the Commandery, Knights Templar and the Eastern Star. In 1959, he received the Silver Beaver Award in recognition of his many years of service with the Boy Scouts, both in the U.S. and abroad.

He was past president of the Massachusetts Land League, and a member of the American Right of Way Association and the Worcester Kiltie Band Association. A former member of the National Guard, Mr. Horne also belonged to Theta Chi, Tau Beta Pi, the Poly Club and the Tech Old-Timers. He had served as vice president of the Class of 1926 and as a member of the WPI Fund Board.

W. Bigelow Hall, '28, a retired general patent counsel for United Shoe Machinery Corp. (now USM-Corp., Emhart), died in Florida on January 9, 1984. He was born in Fitchburg, MA, on Nov. 3, 1906.

After studying electrical engineering at WPI, Mr. Hall graduated with his LLB from Washington College of Law in 1933. Prior to joining United Shoe in 1939, he was with the U.S. Patent Office and Minneapolis Honeywell. He belonged to the American Bar Association, the American Patent Law Association and the Boston Patent Law Association (former president).

Active in community affairs, he had chaired the Needham School Committee and the Community Fund. He was a Mason and a member of Phi Gamma Delta.

Harold C. Bates, '29, longtime plant engineer for Westinghouse Electric Corp., in East Springfield, MA, died on February 5, 1984, at the age of 78. A native of Claremont, NH, he received his BSEE and professional engineering degree from WPI.

During 40 years with Westinghouse, he had been a tester, works engineer, layout engineer and maintenance engineer. In 1966, he retired. After retirement, he was employed as a sales representative by Electrical Motor Repair Co. He was a registered engineer in Massachusetts.

Mr. Bates belonged to the Methodist church, the Masons and the Eastern Star. He was a charter member of the DeMolay and was invested with the DeMolay Legion of Honor.

Uno A. Matson, '29, a retired member of the technical staff at Bell Telephone Labs, North Andover, MA, died in Exeter, NH, on March 11, 1984. He was 76.

In 1929, he received his BSEE from WPI. For 43 years he was with Bell. During World War II he was involved with defense work at Bell Labs in New York City and Murray Hill, NJ. He had two patents on transmission systems.

In 1955, he transferred to the Merrimack Valley plant in North Andover, where he worked on microwave and radar communications. He retired in 1974.

Mr. Matson was a cellist, pianist, local composer and church organist. He was a charter member of the Merrimack Valley Philharmonic Orchestra, a member of the Nashua (NH) Symphony and a founder of the Whittier Chamber Orchestra in Haverhill.

A member of Theta Chi, Sigma Chi and Tau Beta Pi, he also belonged to the American Guild of Organists and the Newburyport Art Association. He was a life member of the American Federation of Musicians.

H. Edward Perkins, Jr., '33, passed away at the age of 72 at his winter home in Tavares, FL, on April 12, 1984. A native of Woodstock, VT, he received his BSEE from WPI.

He had been employed by Perkins Machine & Gear Co. and Winchester Repeating Arms Co. From 1947 to 1962, he worked for Olin Mathieson Corp., where he rose to associate director of R&D. In 1971, he retired as design supervisor from Sikorsky Aircraft, Stratford, CT. Following retirement, he and his wife, Mildred, built a summer home on 525 acres in Bridgewater Corners, VT.

Mr. Perkins, a member of the ASME and Lambda Chi Alpha, was a professional engineer in Connecticut.

Joseph A. Bober, '34, of Milton, MA, died last November. He was born in Manchester, NH, on Sept. 1, 1912. He graduated as a civil engineer from WPI.

During his long career with the U.S. Army, he served as chief of the Corps of Engineers in Boston and as chief of the planning and control branch in the real-estate division of the Corps in Waltham, MA.

Charles C. Bonin, '38, WPI trustee emeritus, died on Hilton Head Island, SC, on April 13, 1984. He was 67.

A worldwide authority on the construction of arch dams and the design of generating stations, he was posthumously awarded an honorary doctor of engineering degree by WPI during commencement ceremonies on May 19. When he learned of the upcoming honor just three weeks prior to his death, he said, "I cannot conceive of anything finer happening to me at this point in my life."

Born in Covington, KY, Charlie graduated as both a civil engineer and a professional civil engineer from WPI. After joining Ebasco Services Inc. in 1938, he served the firm as cadet engineer, civil engineer, project manager for the Far East, Far East representative, chief civil engineer and engineering manager. From 1965 to 1977, he was chairman, president and chief executive officer of Chemico, an Ebasco affiliate, in New York City.

While directing Ebasco projects in Japan, Charlie was directly responsible for the design and construction of the Kamishuba Arch Dam, the first arch dam ever constructed in the Orient. He was concerned with the design of more than 200 thermoelectric, hydroelectric and nuclear-generative stations worldwide. His many publications in this field were accepted as instructional and authoritative.

In 1969, he held the largest number of state licenses of any registered engineer in the nation, one from each of the 50 states and from Puerto Rico, the District of Columbia and the Canal Zone. Charlie told friends at the time, "It's not a stunt. I get these licenses because we do business in those states."

He developed the operating procedure for the Northwest Power Pool to meet critical war-time needs, and formed the first consulting and design engineering company in India. Under his leadership, Chemico designed and built plants in Japan, India, Taiwan, Malaysia, China, Pakistan, Saudi Arabia, South Africa, Libya, Algeria, Egypt, Yugoslavia, UK, Venezuela, Mexico, the Soviet Union, Iran, Finland, South Korea and France. During a ten-year period, Chemico grew from a $50 million a year business to a $500 million a year business.

From 1977 to 1982 he had a private consulting business and continued his engineering practice, primarily in energy-related fields. During the same period, he was a founder and first president of Lighthouse Realty, negotiating the sale of the firm to Marathon Oil. Recently, he was a consultant for Pinehurst Corporation and for the principals of the Delta Group.

A fellow of the ASCE, Charlie also was a member of the national and South Carolina societies of Professional Engineers, the Seismological Society of America, Japan Atomic Industrial Forum, the U.S. Committee on Large Dams, and the S.C. Society of Civil Engineers. He also belonged to Phi Sigma Kappa fraternity, Tau Beta Pi, Skull and the Poly Club.

In 1966, he received the outstanding leadership award from ASME. He was the recipient of both the Goddard Award (1966) and the Taylor Award (1963) from WPI. Active in alumni affairs, he had served as a member-at-large of the Executive Committee and as vice president of the Alumni Association, and as a member of the President's Advisory Council.

In spite of a busy professional and social schedule, Charlie always found time for his family. He had a real zest for life and enjoyed playing golf and bridge and cooking for guests at home.

At Hilton Head, forever modest, Charlie was viewed by friends and business associates as "one of the great men on the island." A former realtor-associate, Rick Turner, said, "Charlie was a leader and helped so many young executives. He did what was best for everyone, more servant than a master."

Rick Turner's words were not empty. He and five other young realtors whom Charlie had guided to success were his pallbearers.

George B. Cattermole, '38, of Hamburg, PA, passed away on May 16, 1983. A native of Passaic, NJ, he was born on Jan. 17, 1917. Studying electrical engineering at WPI, he graduated from the U.S. Naval Academy and held an MSEE from the U.S. Naval Postgraduate School.

From 1939 to 1969, he was with the Navy, from which he retired as a captain. Among other places, he served at the Defense Atomic Support Agency in Washington, DC. Later, he became a self-employed farmer in Hamburg.

Mr. Cattermole belonged to Phi Sigma Kappa, IEEE and the IRE, and he was active with the Boy Scouts and Little League.

Lennart Brune, '40, owner of Brune Abrasive Service Co. Inc., Denver, PA, died in Philadelphia on November 16, 1983. He was 66, a native of Pittsfield, MA, and a mechanical engineer.

Since 1948, he had owned the Denver abrasives firm. Formerly, he was with the Carborundum Co., Niagara Falls, NY. He belonged to ATO and the United Church of Christ.

F. Warren Crowley, '41, died recently in Toms River, NJ, at the age of 64. He was born in Clinton, MA.

He had been employed by the Factory Insurance Co. Two years ago, he took early retirement from Alexander & Alexander Insurance Brokers in New York City, where he was vice president and manager of the loss department. He had been with the firm for 25 years.

Mr. Crowley belonged to St. Patrick's Church and the Knights of Columbus.

Dr. **Myer Krulfeld, '46,** of Bethesda, MD, passed away last fall. He was born in Boston on March 12, 1915.

After receiving his BS in chemistry from WPI, he earned a PhD from the University of Illinois. During his career, he was an assistant instructor in chemistry and physics at WPI and a research chemist at the U.S. Naval Research Laboratory in Washington, DC.

He belonged to Tau Beta Pi, Sigma Xi and the American Chemical Society.

Edward G. Tamulevich, '46, died at his home in Paxton, MA, last December. He was 59 and a Worcester native.

He received his BSME from WPI. He worked for the vacuum melt division of Wyman Gordon in North Grafton and for the Textron plant (superintendent) in Lowell, MA, prior to joining Norton Co., Worcester. He retired from Norton in 1980 after serving as supervisor of building maintenance for 10 years.

He was a member of Phi Kappa Theta, Our

Lady of Vilna Church (Men's Club past president), Lithuanian Charitable Society and Lithuanian War Veterans Organization. Also, he was active with the Bishop's Fund and the Knights of Lithuania. He had been chairman of the former Paxton Board of Public Assistance. In World War II, he was a Navy lieutenant in the U.S. and Panama.

Clay B. Wade, '46, of Decatur, GA, died November 20, 1983, at the age of 57. He was born in Morehead City, NC.

After graduating as a civil engineer, he joined the Southeastern Underwriters' Association in Raleigh. In 1950, he was transferred to the home office in Atlanta. Later, he became staff engineer and assistant chief engineer. In 1969, he was named administrative assistant. Most recently, he was an insurance services administrator with the association.

Mr. Wade had served as chairman of the finishing-processes committee of the National Fire Protection Association. He was active on American Insurance Association committees, and belonged to the Georgia Mineral Society and the Cobb County Gem and Mineral Club.

Karl H. Kalbfleisch, '51, died February 22, 1984, in West Haven, CT, following a long illness. A native of Newton, MA, he was born on Aug. 31, 1925. He graduated as an electrical engineer from WPI.

Following graduation, he was employed by Norton Company in Worcester, where he was involved with industrial-diamond work in the R&D department and with the dia-electric heating process, a forerunner of microwave ovens. In 1967, after he was injured in an electrical accident, he joined the Communications Center in Guilford (CT) Town Hall and was named communications supervisor and director of ambulance services for the town in 1976.

Mr. Kalbfleisch was a lifelong radio hobbyist. His call sign, W1XYB, was on his auto license plate. He belonged to ATO. During World War II, he was in the Navy V-12 program and studied at Tufts and Bates. Earlier, he attended MIT. He had served WPI as an admissions counselor.

George F. Whittle, '52, a design engineer and retired Navy commander, died at his home in North Scituate, MA, on January 2, 1984.

He was born in Passaic, NJ, on Jan. 20, 1930, and received his BSME from WPI. Prior to founding Whittle Associates, a New England design and plastic sales and engineering firm, he had been employed at Waterbury Manufacturing Co. and the Raytheon Co. A Navy veteran of 23 years, he trained as a jet pilot in Pensacola, FL. He had served as a scoutmaster for the BSA for many years. He belonged to Phi Gamma Delta.

Thomas R. DeLuca, Jr., '53, of Haverhill, MA, died September 6, 1983. A Haverhill native, he was born on June 24, 1931. He graduated from WPI as a chemical engineer in 1953.

During his career, he was an officer in the U.S. Navy, an engineer for Du Pont and the Bristol Company and a mathematics teacher in West Newbury, MA, Andover, Danvers and Chelmsford. He belonged to PKT and PDE.

Henry F. Spadoni, Jr., '55, president of JDS Inc., Springfield, MA, died in Westfield on January 22, 1984, at the age of 51. He was a native of Hopedale, MA.

He received his BS in chemical engineering from WPI. Following employment with Monsanto and John H. Breck Inc., he served as president of Customer Savings Corp. and as a founder of Morgan Homes, before he formed JDS Inc. in 1979.

He was a past president of the Home Builders Association, former member of the Rotary Club, and he belonged to the Chamber of Commerce and St. Thomas the Apostle Church.

He belonged to the Packaging Institute, as well as to Phi Kappa Theta and PDE. He held an MBA from Western New England College and had served with the Army.

Roland E. Mason, '59 SIM, of Worcester passed away recently. He was born in Worcester on August 14, 1923.

He had been plant manager for Form Roll Die Corp. in Worcester.

George H. Comeau, '60 SIM, died at his home in Whitinsville, MA, on October 25, 1983, at the age of 70. A native of Schenectady, NY, he attended the School of Industrial Management at WPI.

Before retiring in 1976, Mr. Comeau had been superintendent of the ATF-Davidson division of White Consolidated Industries (formerly Whitin Machine Works). He graduated from Notre Dame and also attended Harvard Law School.

He belonged to St. Patrick's parish. For many years, he was active with a local Boy Scout troop.

Gerald J. Lyons, '68 MNS, former head of the mathematics department at North Quincy (MA) High School, died December 10, 1983, at his home in Barnstable, MA. He was 63 years old.

He was born in Quincy. In 1968, he graduated with his master's degree in natural science from WPI. He graduated from Harvard and received degrees from Boston University and Hartford University in Connecticut.

In 1982, he retired as head of the math department at North Quincy High School, where he had taught since 1970. Formerly, he had taught at the Manter Hall School on the Cape and in Boston and at Thayer Academy in Braintree.

John J. Foran, '75 SIM, died February 20, 1984, in Worcester at the age of 63. He was a native of Worcester.

In 1940, he graduated from New England School of Accounting. In 1980, he retired as chief accountant in the grinding wheel division of Norton Co., Worcester, where he had been employed for 33 years.

Correction

In the May 1984 issue of the *Journal*, we mistakenly reported that Paul B. Morgan (Jr.), '30, had retired as chairman of the WPI Board of Directors. Paul S. Morgan is the correct name of the retiring chairman. Our apologies to all concerned.

LETTERS

Notes on TOP TEN

Editor:

The author endeavors to show that all numbers were not created equal [Robert Kanigel, "What's the No. 1 Number?", May 1984]. Some rate as stars, while others remain in the background. He states, "Number nine carries the flavor of something almost true but not quite, of something missing incomplete. Number nine has little to recommend it."

In these days of the computer the author has probably forgotten his grammar school tables of 9's and the method of checking additions, subtractions and multiplications.

The claim of number nine for 1st place over the other numbers is based on the interesting makeup of the table of 9's and the unique use of a number, in this case 9, to check the accuracy of addition, subtraction and multiplication.

No other table of numbers shows the uniformity of having the sum of the digits equal to the number itself.

No other number has similar characteristics that by subtracting a number from the multiplier, in case of nines 1, the 2nd digit is the amount to equal the number, i.e. multiplier: $3 - 1 = 2$ & $7 = 27 = 9$, $4 \times 9 = 36$, $7 \times 9 = 63$.

No other number has the same uniformity on the reversal of the digits in its table of numbers 18 to 81, 36 to 63, 45 to 54, etc.

Probably the outstanding feature which sets it apart from other numbers is the discarding the sum of nine as a check on the accuracy of accounting in addition, subtraction and multiplication.

Chester N. Inman, '14 ME
Worcester, MA

The "real" world's not the only thing that's changed.

Come on back to discover who and what have changed how and why since the reign of your class at WPI.

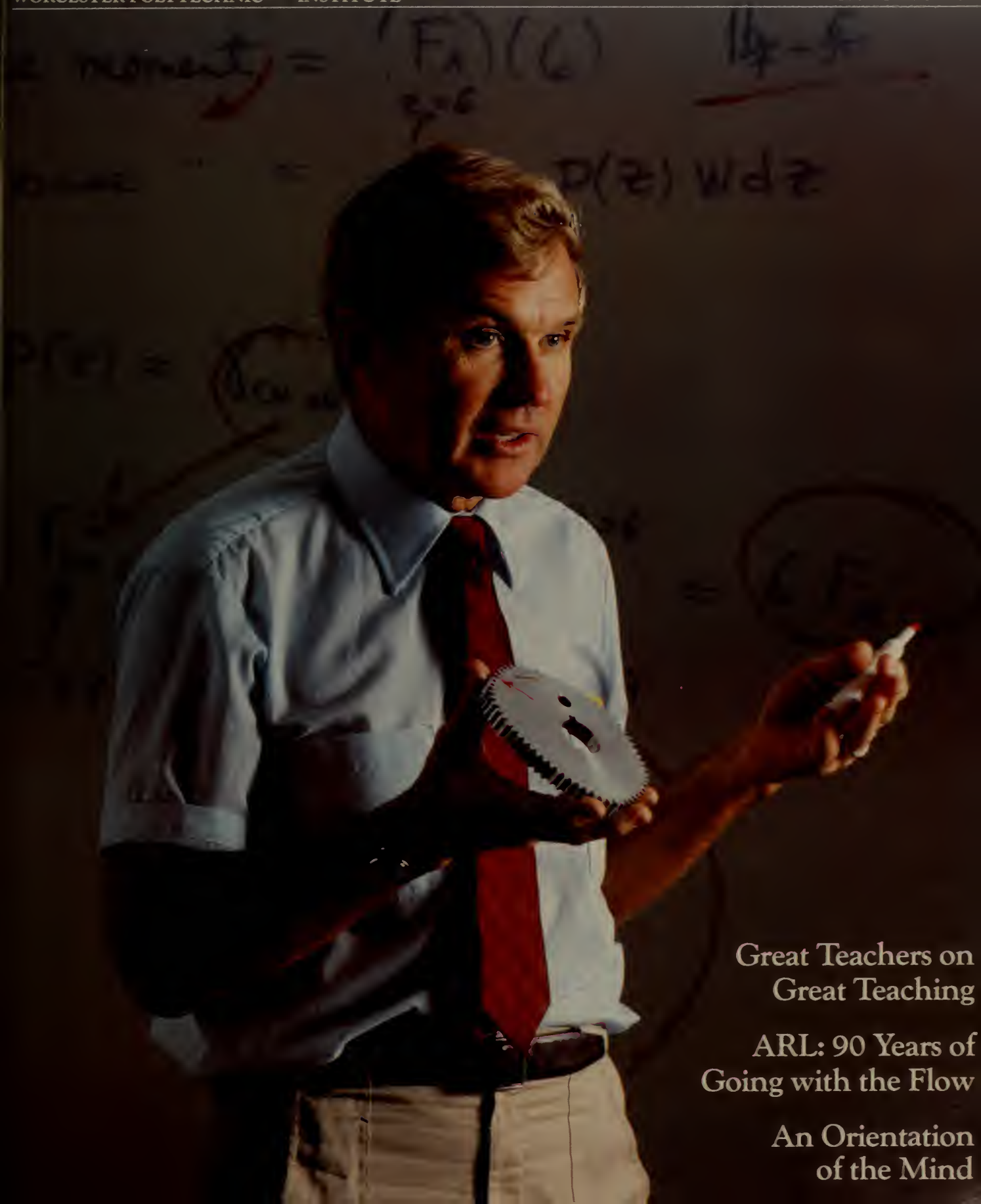
HOMECOMING 1984

And Reunion for the classes of '64, '69 and '74.

September 22, 1984

WPI Journal

WORCESTER POLYTECHNIC INSTITUTE NOVEMBER 198-



Great Teachers on Great Teaching

ARL: 90 Years of Going with the Flow

An Orientation of the Mind

WPI Journal

WORCESTER POLYTECHNIC INSTITUTE

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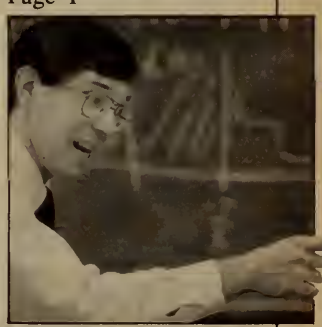
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Cover: Professor of Mechanical Engineering Carlton Staples is a "class act" (see page V). Photo by William Denison. Opposite: What better way to spend a sunny Saturday afternoon in the autumn. Photo by Michael Carroll.

NEWS FROM THE HILL

Thanks a million!

For the first time ever, the WPI Alumni Fund raised more than $1 million in gifts, surpassing the million-dollar goal established by the Alumni Fund Board.

In celebrating the triumphant climax of this year's annual campaign, Fund Board Chairman Gerald Finkle, '57, exclaimed, "It's always a pleasure to bring good news! So it's with gratitude that I report this milestone in the history of the Alumni Fund. More than 5,800 alumni contributed a total of $1,007,873 to WPI, setting new records for both dollars and donors." This is an astounding 19-percent jump over the amount raised in the 1982–83 Fund Year. The year's average gift of $173 and the 40.97-percent participation rate are both well above the national averages.

Another highlight of the Fund was an increase from 78 to 123 in the number of donors who contributed $1,500 or more and in so doing joined the President's Advisory Council. What is more, the anniversary classes of 1934, '44 and '59 contributed more than $520,000, $350,000 more than any other Fund program. And the Class of '59 had a whopping 94-percent participation rate! In terms of participation among non-anniversary classes, the Class of 1938 had the highest rate; six out of 10 alumni contributed from this class. The classes of 1940 and '37 were only a few percentage points behind. The Class of 1980 boasts the most donors, followed by the classes of 1973 and '74. And the largest class gifts from other than anniversary classes were received from the classes of 1942, '38 and '39, in descending order.

Additional good news is that for the fifth time in six years, WPI has won the U.S. Steel-CASE (Council for the Advancement and Support of Education) Award for Sustained Excellence in alumni giving, the premier award in this field. Only Gustavus Adolphus College boasts a better record, and only the alumni giving performances of Dartmouth College, the University of Michigan and Siena College equals the generosity of WPI alumni.

Gerald Finkle, '57 ME, Fund Board Chairman.

"The credit for this string of successes," notes Finkle, "rests with the loyal and generous support of our alumni and the efforts of the 1,200 graduates and student volunteers who personally contacted the WPI alumni body. Thanks must also go to past volunteers and Fund Board members, whose work laid the groundwork for this year's success."

Dr. Edmund T. Cranch, president of WPI, offered an interesting perspective when news of the Fund's landmark achievement reached his office: "You know, when we approach corporations and foundations for support of WPI, the breadth and depth of our alumni involvement, as evidenced by the uninterrupted Alumni Fund giving, is often the deciding factor in winning such support. This alumni involvement is a ringing endorsement that proclaims to students, parents and prospective donors alike that to belong to the WPI community is to join a special group indeed."

In May 1984, Alumni Fund Managing Director Sharon C. Davis resigned to become Director of Development of the Bancroft School, Worcester. During her six-year tenure at WPI, the college was awarded five of its total of seven prestigious CASE-U.S. Steel awards. She is succeeded by Craig L. Esposito, former Associate Director of Development at Harvard University.

Washburn reborn: Yankee ingenuity lives on.

In 1869, when the Washburn Shops opened its doors to students at the new Worcester County Free Institute of Industrial Science, the building was, as benefactor Ichabod Washburn had intended, a place where young men could learn a trade in an environment that schooled them in the most modern techniques of factory production. In fact, under the direction of Milton P. Higgins and George I. Alden (later to co-found the Norton Company) the Shops became a prosperous business as well as the embodiment of Mr. Washburn's dream. For almost 85 years, the Shops brought additional income to the college, with students designing and producing drawing tables, lathes, bench grinders and even hydraulic elevators.

Meanwhile, Templeton tinmaker John Boynton had offered to give his life's savings to establish a school with goals complementary to those of Worcester's Ichabod Washburn. He had long foreseen the need for a school where bright young men could be educated to take their places in the management ranks of America's industrial might.

Throughout the last twelve decades, Boynton and Washburn—the men and the distinctive buildings they erected—have stood tall on the hill overlooking downtown Worcester from the west. And the Two Towers tradition that these sagacious men's intentions established, though modified somewhat to accommodate today's educational, professional and societal needs, continues to define the mission of

the college through the WPI Plan.

Though the original facades of both Boynton Hall and the Washburn Shops and Laboratories still stand, both rugged old structures have been reborn. In 1978, following a complete renovation, Boynton was rededicated. And as we went to press, contractors were putting the final touches on a massive revitalization and expansion of the Washburn complex, at a cost of about $4 million.

WPI has named a new Washburn lecture hall in honor of life trustee Milton P. Higgins, in recognition of the leadership he has provided the college for nearly three decades. A past president of Norton Company, he is the son of Aldus Higgins, '93, who bequeathed his estate—the Higgins House—to WPI.

Rededication has been set for October 18–20 and is to include a symposium on such topics as national productivity, engineering education and the technology needs of higher education. A panel of national authorities on these subjects will participate. Completion of this construction project marks the final element of WPI's $17.5 million Capital Program.

Look for more details on Washburn and the rededication of this second of WPI's Two Towers in the February 1985 issue of the *WPI Journal*.

Daniel Duffy Associates

President Cranch Will Resign to Head Wang Institute

Just hours before press time, Dr. Edmund T. Cranch announced his decision to resign as president of WPI to become president of the five-year-old Wang Institute of Graduate Studies in Tyngsboro, MA. The resignation is effective June 30, 1985. Cranch will succeed Dr. An Wang, founder and current president of the Institute and head of Wang Laboratories Inc.

Cranch will lead one of the nation's newest graduate schools. An independent, non-profit educational institution, Wang Institute pursues a dual mission: to provide the professional graduate education necessary to meet the demands of industrial software development, and to help alleviate the acute nationwide shortage of highly skilled software specialists.

Cranch has already contributed to Wang Institute as a member of its Board of Trustees, as an ex-officio member of the school's National Advanced Advisory Committee, and as a former member of the Institute Advisory Committee.

In an open letter to the WPI community, Cranch said, "I am certain you can appreciate the internal turmoil and wrestling I went through in making a decision. In the end it was my instinct to pursue another institution building challenge . . . which prevailed."

Cranch joined WPI as president in 1978. A search committee, headed by Trustee vice chairman Irving James Donahue, Jr., '44, will be named soon, according to Trustee chairman Howard G. Freeman, '40.

The next issue of WPI *Newsbriefs*, to be published in late November, will contain more complete details of the Cranch decision, but we did want to bring you this historic news as soon as possible.

At a reception hosted by Dr. and Mrs. Edmund T. Cranch on August 26, these alumni families and their Class of 1988 son or daughter posed for a photo outside of Boynton Hall. In all, 151 freshmen of the 683-member class are related to WPI alumni. Congratulations to these members of the growing WPI community—new and old-er.

Things May Never Be The Same Again

When the Class of 1988 arrived on campus this fall, many of their questions—and their qualms—had already been put to rest, thanks to perhaps the most imaginative orientation program in the nation.

By Kenneth McDonnell

"Hi, Mom. It's me . . . Oh, OK . . . Yeah . . . How's Dad? . . . Aw, that's great! . . . Yeah . . . Me? Well, not so good, actually . . . Yeah . . . Y'see, I got a 37 on my first physics exam . . . But the class average was only 52 . . . Yeah, I know I was good in science in high school, but things are different here. It's not like I thought it would be. Maybe I made the wrong choice of majors. There's so much pressure here—in class, and out, too—from my friends. You know."

So goes the first phone call to the folks at home. Or, consider another freshman's first weekend back at home when, upon announcing to Dad that he's "going out for a while," the Old Man lays down the law, letting Junior know in no uncertain terms that midnight remains, as it had been in high school, the young man's curfew.

"But, Dad," Junior counters, "at college I can take care of *myself!*" Finally, after 10 minutes of the young man's best attempts to change his father's mind, the coffin is nailed shut: "This discussion," father shouts, "is over!"

Realistic situations? Or are we viewing episodes intentionally overdramatized to make a point?

Probably more the latter, if the truth be known. For what they are, actually, are role-play exercises, staged by members of The Masque, WPI's student drama society, for the benefit of incoming WPI freshmen and their parents. These and other mini-dramas—some live, some videotaped—along with a host of other presentations, no-holds-barred discussions and academic department exposure, are the makings of WPI's award-winning Orientation—"O" for short. And when they are played out before curious and often apprehensive freshman families—well, they can have a real impact on students' and parents' adjustment to that ineffable commodity called higher education.

"The whole idea behind Orientation," says Bernard H. Brown, Dean of Students and the creative force behind the program, "is not only to introduce the newest members of the WPI community to the college itself, but perhaps more importantly, to give them a glimpse of the kinds of *changes* that both students *and* parents can expect as a result of entering WPI—or any other college, for that matter."

A "veteran" father who sent his second son to WPI this fall gives other parents his perspective on the WPI experience.

Addressing the details of what it takes to succeed at WPI is not a trivial endeavor. For Brown, the logistics—handling the 200-plus freshmen and their parents who come for one of the three sessions in June, housing them overnight in campus residence halls, recruiting and training his 35 student Orientation leaders, and arranging for faculty and staff involvement—take time and unending attention to detail.

Yet it's the Orientation leaders, or "O-Team"—an elite corps of upperclassmen, some of them only a year into their own college careers—who are the lifeblood of Orientation. For the 36 or so hours that freshman families are on campus, members of the O-Team play host, facilitate group discussions and become resident experts, each leading a group of 30 or so visitors through the nearly 25 presentations, discussions, receptions and tours that are packed into the program.

"Sure," says the O-Team's Sean McShea, a sophomore industrial engineering major from Worcester, "it's a big commitment. We spend six months in training and working at Orientation, but we're all friends when it's over, and the excitement Orientation generates in freshman families makes it a good experience for us—even when you have to give up the last weekend of the summer."

Adds O-Teammate Lori Freeman, a chemical engineering senior from Stoughton, MA, "It's neat when the fresh-

"Orientation gave me the feeling that the faculty really care about my future."
—From a student.

"It was fun to stay in the residence hall where my daughter will be living."
—From a parent.

men actually get here for classes. Often they come up to me and say, 'I remember you from Orientation. Can you help me with . . .' this or that concern that's still new to them."

The O-Team embraces a cross section of the student population—campus leaders, fraternity members and independents, athletes, students from all academic departments. Meanwhile, "official" information and answers to concerns academic and institutional flow through a well-orchestrated, intensive series of seminars, workshops and informal chats led by deans, faculty and professional staff. Humanities Prof. Kent Ljungquist, for example, explains to parents and later to students what the Humanities Sufficiency is all about. Prof. Joseph Bagshaw introduces incoming Biology and Biotechnology students to his department. Janet Richardson, Associate Dean of Students, leads a session dubbed "The Living End and The Three R's: Rights, Roommates and Responsibilities." Director of Graduate and Career Planning William Trask addresses what the job market may hold four years hence. In all, some 25 faculty and 15 staff members introduce their particular specialties to the freshman families.

Says Dr. James E. Groccia, Director of the Student Counseling Center, "Orientation is a vital cog in the academic wheel, for both educational and psychological reasons." Educational, he says, by introducing students and parents to the system. Psychological, by forming an attachment to the college. With the help of O-Team members, Groccia leads separate workshops with students and parents on the transition from high school to college life.

"This transition," he asserts, "is one of the most crucial in any person's attachment-separation life cycle." Research has shown, he adds, that most college dropouts have failed to form a meaningful psycho-social attachment with the institution they leave.

Groccia's Orientation sessions address the concerns which he and his Counseling Center staff deal with most frequently: loneliness, family changes, academic and peer pressures, and the ups and downs—the exhilaration and the anxiety—which can grip nearly all college students, especially freshmen leaving behind all that is familiar to commence upon the next phase of their lives.

Typically, he says, students spend only 20 to 25 percent of their time in classes and labs. The other 80 percent finds them studying, pursuing extracurricular interests, watching *General Hospital*. And it's often the choices they make now, in the midst of pressures tugging at them from all sides, that can help sculpt the quality of their lives for years to come.

Meanwhile, back home, changes are in the works, too, though often they are not so obvious. "The family is a system," says Groccia. When one of its parts changes—in this case, a daughter or son leaves for college—the rest of the parts will probably change to varying degrees. "Don't be surprised," he advises students, "if Mom and Dad's and your siblings' relationships change when you leave. They may plan events like vacations without you from now on. Or maybe they'll make your room into a study or guest room they always wanted." Remember, he adds, starting college means a lot more than just coming up with the tuition.

To be sure, Orientation has a lighter side, a characteristic that foretells what for most students is a vital but subtle part of college life's "learning curve." For example, there's one O-Team member's good-

O-Team members pose outside Higgins House last spring.

"In the future, please tell parents and students how much *we* got out of it."
—From a parent.

"Now, I'm more confident about attending WPI in the fall."
—From a student.

natured recollections of his first roommate's foibles. Then there's the *WPI Tonight Show*, a wildly funny take-off on Johnny Carson's late-night television mainstay, hosted by professional comic Tom Parks. Here, "guests" such as Student Government and Interfraternity Council representatives, a Campus Police officer and a residence hall advisor play along with Parks's antics while giving their Harrington Auditorium audience a rundown of their organizations' functions and how students can get involved. It's an ingenious way of entertaining, informing and easing freshmen into the mainstream.

"In each of Orientation's four years," says Brown, "we've tried to bring in innovative ways of getting lots of information to lots of students and parents in a short period of time, hopefully without thrashing them with boring lectures."

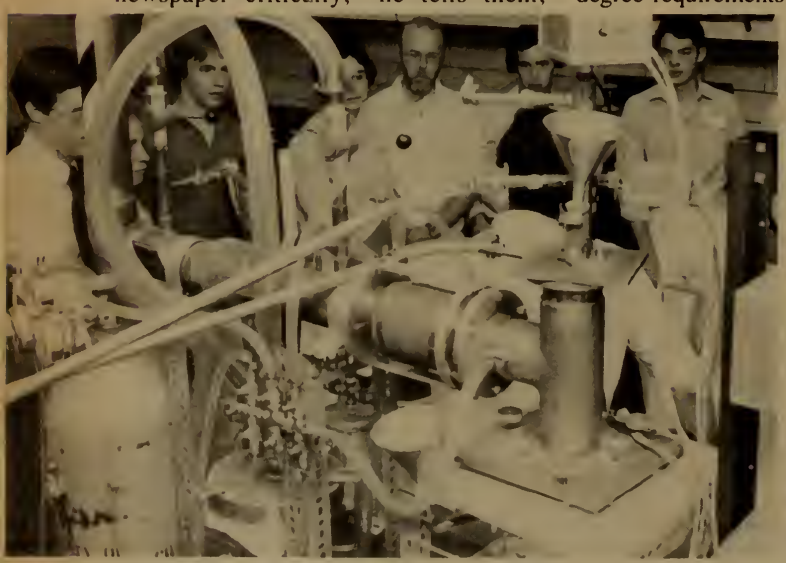
Yet all is not fun and games. In his fast-moving talk on WPI's computer science curriculum, for example, Prof. James Coggins advises students against running out to buy a personal computer just because they're about to enter WPI. "Spend your time now trying to write a decent paragraph, or learning to read the newspaper critically," he tells them, "because I just don't have the time, the patience or the inclination to teach you how to think." In another session, Dean John van Alstyne tells parents in hard, cold terms that even for the most gifted students, WPI is not likely to be a cakewalk. He relates war stories of courses failed, of dreams become disillusion, but stories, too, of students who have crossed sometimes staggering hurdles after stumbling at the start. Later, he tells students the same things. For both groups, the talk both humbles and inspires.

"You don't accomplish anything," van Alstyne contends, "by glossing over the facts. All we can tell them is that WPI will be tough, that social and perhaps romantic pressures will as likely as not distract them from the real reason they're here. But we can also assure them that there are people here to help." For students and parents alike, Orientation is a chance to begin forming a network of resources as well as to meet peers, faculty and the larger WPI community. "Parents need to know almost as much about WPI as their sons or daughters do," van Alstyne says. "They need to know our terminology, like MQP, IS/P, IQP, as well as our grading system and degree requirements." Only twice in four years, he says, have parents told him that his no-nonsense seminar turned them off to WPI.

Cheryl Delay is a sophomore mechanical engineering major from Bennington, NH, and a first-time O-Team member. Of the entering freshmen she got to know through Orientation, she says, "They're great! but so . . . well . . . young, I guess." And as soon as the words are out of her mouth, she blushes with the realization that she, too, was one of the "so young" just a short year earlier.

"You can see changes in the freshmen during the weekend alone," adds Karen Reardon, a junior from East Bridgewater, MA. Karen, like about a quarter of the O-Team, has served for two years as an Orientation leader. "Some freshmen arrive scared and apprehensive," she says, "but by Sunday afternoon, they can't wait to come back in the fall."

There's a special esprit de corps that develops on the O-Team. It's a closeness built on mutual respect and the result of days, weeks and months of what can only be called rigorous training. In January, as any good coach does, Bernie Brown begins gathering his team, relying on



Meeting the faculty: Professor Lenn Kupferberg gives freshman families a tour of a Physics Department lab (above left), and Dean John van Alstyne speaks to parents on academics at WPI.

"It was exhausting, but well worth not missing a thing."
—From a parent.

"Totally awesome!"
—From a student, of course.

interviews and the input of professors and counselors who know the recruits. And in spite of the fact that the team plays for free, more than 80 students applied this year for the 35 spots on the roster.

Brown makes his selections, and the team gets down to business, meeting weekly with faculty, deans and staff and in March retreating for a long weekend off campus at nearby Barlin Acres. Here, the tightness of the group really takes hold, as students with a variety of backgrounds, personalities and academic interests role-play situations likely to occur in Orientation, learn how to handle the tough questions they may face, talk candidly about themselves, share the cooking and other chores, and, of course, socialize together. It's here also that the coach begins to see which individuals will work best together—be it for one of those videotaped mini-dramas, for a question and answer session, or for leading a discussion group with students or parents.

Later, in the spring, Brown requires that each team member complete Oral Communication Specialist Kay Draper's four-week course at WPI. This serves as a final but non-trivial warmup for the role of host that he'll play throughout Orientation. Mrs. Draper's class is a piece of O training that members almost without exception recall fondly. Says Jean Kelly, a senior mathematics major from Natick, MA, "Even though we didn't always realize it, we were using every bit of that training."

Nearly all colleges offer some sort of freshmen orientation. The focus can be on academic advising and registration. It can be topical: one large university, for example, spent three days addressing with students and parents their roles in a world hounded by the threat of nuclear annihilation. Or it can touch on some combination of scholastic, social and secular elements.

But WPI orientation, says Brown, is different. "It has to be, simply because the WPI Plan—its curricula, its grading, its project emphasis, its calendar—is so different from conventional educational programs."

Look at the reaction from other colleges to WPI's orientation design. Last year, at the national conference of the 300-school National Orientation Directors Association, WPI was awarded top honors for orientation program materials. Karen Reardon accompanied Brown and three other O-team members to the conference. After an airing of a videotape of the *WPI Tonight Show*, she recalls, "We were flooded with questions about our format. Most often, though, people wanted to know how we 'entertain' students and parents." Apparently, she adds, a good many schools look at orientation as a perfunctory ritual.

As often as not, says counselor Groccia, it's parents who get the most out of Orientation, a program that has become, for all practical purposes, required fare for entering freshmen and strongly recommended for their folks. After all, he says, there is a special partnership parents have built with the daughter or son they are sending out into the world, often for the first—and last—time.

Yet in his talks with parents, Groccia urges them to encourage in their son or daughter, for the next four years, what he calls *positive selfishness*. "Say to your child: 'Here are four years and $40,000. Go and learn something. Don't worry about us; we'll take care of ourselves. Take on some new challenges. Start a profession. Feed your head. Become somebody.'" For most students, he asserts, this may be their last opportunity to be positively selfish. "For some parents, it may be their first chance to allow it."

Getting to know you . . . on Beechtree circle between Orientation sessions.

90 Years of Going with the Flow

Alden Research Laboratory Celebrates a Grand History and Prepares for the Challenges of the Future

By Michael Shanley

The instrument room, which overlooks the huge modeling area, is used for studies like the one of a Taiwan power system. From left are the minicomputer and digital voltmeter; the video terminal, which displays real-time temperatures in the model; and the automatic controllers for building atmosphere and sump water temperature.

The white Styrofoam balls stretch from the shore to the horizon, rows and rows of them perched atop the calm water of the bay in perfect symmetrical order.

Attached to each of the 500 or so balls is a temperature sensor. In the soft sand beneath the surface of the water, a series of blue and red wires run from the sensors to the shore. On the beach the wires meet to form a spaghetti-like tangle that vanishes beneath a wooden walkway before reappearing in the control center that overlooks the bay.

Inside the control center the wires attach to a computer system that scans 18 sensors per second. A video terminal displays the temperature at each sensor while another part of the automatic data acquisitions system provides a continuous series of temperature printouts.

At issue here is the effect the discharge of warm water from a nuclear power plant will have on the water of the bay. Tidal currents that reverse direction and change in intensity as they near the shore complicate the picture.

Perhaps the oddest thing about this bay, though, is that no fish swim in it. Nor is it ever rained on. Direct sunlight never hits it. Even at its deepest point the water is just 9 or 10 inches deep. The entire bay, in fact, measures just 81 by 167 feet. What's more, it's all indoors, inside one of the huge test facility buildings at the 20-acre Alden Research Laboratory (ARL) in Holden, MA, five miles from the main WPI campus.

ARL, which this year celebrates its 90th birthday, has for years enjoyed worldwide renown for its construction of elaborate physical models made of concrete, fiberglass, wood, sand, steel or plastic. The lab has simulated the workings of power stations, rivers, dams, spillways, breakwaters, shorelines, intakes and pumps to provide clients—usually a utility or an international engineering firm—with the information they need to determine how best to proceed with a proposed project or how best to solve an existing problem.

The water temperature study mentioned above offers a good example. The client is Taiwan Power Company; the bay is on the north coast of Taiwan. ARL was hired last year to look at the temperature patterns created by the discharge of 10,000 cubic feet per second of warm water into the bay. Of primary importance is recirculation. With roughly a two-kilometer distance between the point of discharge and the point of intake, it is vital that the water coming back into the plant not be too warm. As ARL Assistant Director Dominique N. Brocard explains, there is a lot at stake.

"Even a one degree Fahrenheit increase in the temperature of the water coming into the plant could cost as much as $2.5 million a year, because the efficiency of the plant would drop dramatically," he says.

In addition to scanning the temperature sensors, the computer system ARL is using for this study controls the inflow and outflow to the model to simulate the tidal currents. The hour-long tests, which cover one "real world" tide cycle, proceed with virtually no human interference.

After the lab has completed its tests, Taiwan Power will be able to choose from several options. Perhaps they will need to reverse the intake and discharge points, change the speed of discharge, move it farther offshore or build a dike between intake and discharge points.

While the work ARL does now is decidedly high-tech, models built in the past were no less impressive. In the late 1950s, for example, ARL built a 1 to 50 scale model of the Niagara Falls power project. The 600-foot long, L-shaped model was commissioned by the New York State Power Authority to check the effects of a proposed system that would take in water above the falls, carry it in twin conduits four miles under the city, and, finally, dump it into a canal that would carry the water to a projected power station.

In 1969, ARL modeled a 17-mile stretch of the Hudson River for Con Edison to determine how the warmed water from the Indian Point nuclear reactors would flow as the tides changed. That was the first of a series of models studying Indian Point, including one that is currently set up to study the movement of fish in the affected area.

ARL has also modeled the Patuxent River on Chesapeake Bay, the Mississippi and Colorado rivers, the Euphrates in Turkey, the Rio Grande in Brazil and the Palo Seco near San Juan, Puerto Rico, to name just a few.

In addition, ARL engineers do field work, traveling across the country or around the world to conduct on-site studies.

The lab is also known for its flow meter calibration facilities, which are among the largest and best in the world. Even minor inaccuracies in a flow meter (used to measure the amount of fluid passing through a pipe) can translate into huge sums of money, so precise measurement is a must. Meters big and small, old and new, are sent from all over the world to be checked out at ARL, where the calibration is accurate to within one quarter of one percent.

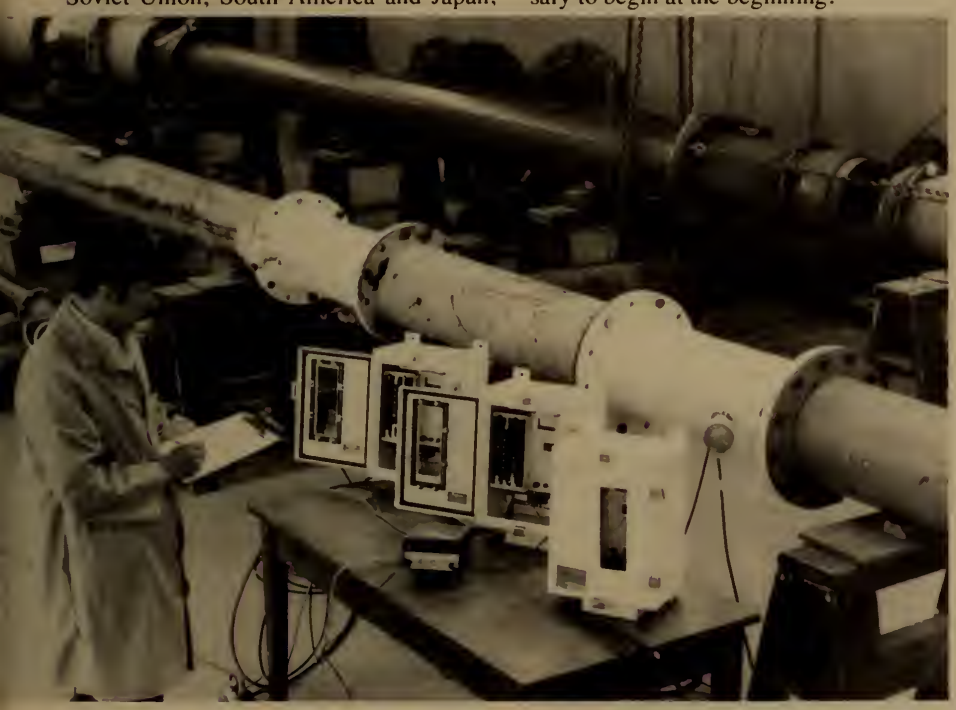
Despite its great scope of activity and its world renown, however, ARL remains something of an anomaly. For example, the lab is well known to hydraulic and fluid mechanic experts in places like California, New York, Egypt, Scotland, the Soviet Union, South America and Japan, but many students spend four years at WPI and leave without ever having visited—or even having heard about—the place. Albert G. Ferron, '57, who heads the flow meter operation at ARL, tells the story of one embarrassed client who called to get some calibration work done. "He was a WPI grad, but he never knew ARL existed," says Ferron. "Ironically, he had been referred to ARL by an RPI grad."

Another curiosity: ARL is perhaps WPI's most visible arm—its name is known across the globe, at least in certain engineering circles. Yet few people associate WPI with fluid mechanics.

The main WPI campus and the lab have always enjoyed an unusual relationship. At times, the lab seems to have been looked upon as a brilliant but troublesome stepchild that no one was quite sure what to do with. And although ARL is very much a part of the school, it is a "self-supporting research department," and ARL Director George E. Hecker emphasizes the 'self-supporting.' "We're totally dependent on research contracts," he says. "Without them, we simply wouldn't exist."

The term research here means not just "pure," National Science Foundation-type grants, though the lab does get some of those, but also applied research—studies conducted for clients—which make up the bulk of the work.

But to really understand what Alden Research Laboratory is today, it's necessary to begin at the beginning.



ARL calibrates flow meters to within one quarter of 1 percent by weighing the water for a specified time. Here two ultrasonic flow meters (the light-colored pipe) are calibrated.

Professor C. M. Allen at work in the lab's original building, circa 1898.

When George I. Alden stood atop that knoll in the Chaffins section of Holden one day in 1893 and looked out on acre after acre of woods, he knew he had found the spot. Alden, then head of the WPI mechanical engineering department, had for some time realized the need for a fluid mechanics research laboratory and was looking for the right place to begin one.

By the following year, he had arranged to have the site donated by Trustee Stephen Salisbury, complete with water rights to a 150-acre pond. He had also gotten the state of Massachusetts to kick in about $10,000, a good sum of money in those days. In 1894, in a small building moved to the site by horse and wagon, an experimental laboratory was established.

Alden, who would go on to help found the Norton Company and serve as its president and chairman, soon turned the lab over to one of his former students, Charles M. Allen. Alden would always support the lab, however, financing several projects during his lifetime and, through his trust fund, making possible a number of additions and renovations in later years.

At first, much of ARL's work involved the testing of water wheels, pumps, engines and turbines using the Alden Absorption Dynamometer, a water-cooled disc brake Alden had invented. Other testing equipment included a 36 x 16-inch Venturi meter—the first of its kind in the world—that had been on display at the 1893 Chicago's World Fair (and would, incidentally, be used until the 1970s) and a Fairbanks standard scale for weighing water.

Allen, who would direct the lab for more than 50 years, had a knack for laboratory work. He preferred to test theories by experiment and never really trusted anything that could be proven only on

ARL's rotating boom is a national historic mechanical-engineering landmark.

paper. He was also, as they say, a real character.

"He was physically impressive," recalls Lawrence C. Neale, '40, who worked for Allen and would later become ARL's third director. "He had snow-white hair from an early age and a peaches and cream complexion. He was about six feet tall, and weighed 200 pounds—he used to check scales by standing on them.

"He always, I mean *always,* carried a small tool kit with him—screwdriver, S-wrench, pocket knife, Stilson wrench, pliers, 6-foot rule. Mrs. Allen would sew special leather pockets into all his suits so the kit wouldn't wear through."

Allen was responsible for construction of the lab's rotating boom, built in 1908 as a circular test apparatus for hydraulic experiments and for rating current meters. The boom, now a national historical mechanical engineering landmark, was originally built of wood, but soon was replaced by a stronger steel model. It has been used over the years to test aircraft propellers, artillery shell ballistics, ship logs (which measure speed through water), minesweeper paravanes (devices that sever mine moorings) and water turbines.

Allen was the man who developed the salt velocity method of measuring water flow, a process of electrically recording the speed of a cloud of salt through a known amount of water in a measured length of pipe. The method would become an international standard.

"The amazing thing about Allen," says Larry Neale, "is that no one ever saw him do any calculations, except in his head."

Testimony to that is the way he developed the salt method. "You know," he was quoted as saying, "I've watched sheep going down a road, some run fast in the middle of the road and some dawdle by the side to eat grass—then they change and the ones in the middle get to the edge and those at the edge get to the middle, but the whole flock moves along at a steady rate. That's what water does in a pipe."

He was also among the first to use scale models to study fluid flow, constructing miniature dams and rivers for cities, towns and power companies.

One of Allen's favorite pastimes was appearing before various civic groups to lecture on "The Use and Abuse of Gasoline," a comic yet instructional presentation that featured spectacular demonstrations of fire breathing and exploding pans.

"I used to drive him to all the lectures," says Neale. "I think I counted once that I had seen it 19 times. He never tired of it, though."

Allen's right hand man throughout the 1930s and '40s was Leslie J. Hooper, '24, a brilliant young hydraulic engineer who, in 1950, would succeed Allen as director. Together, they authored a number of important technical papers.

It was Hooper who, beginning in the early 1940s, oversaw what would become a long association with the Navy. Much of the work, classified at the time, involved the testing of missiles, torpedoes, mines and rockets. High-speed cameras were used to record the projectiles' behavior. In later years, ARL would test Mercury and Gemini flight capsules to see whether they floated and how stable they were.

The early 1950s at ARL were devoted almost exclusively to Navy work. Then, in the late '50s, thermal discharge studies began, first for fossil fuel plants and, later, for nuclear plants. This work, in progressively more sophisticated form, would be an ARL mainstay through the '60s and '70s. Physical and mathematical modeling of waterways would also continue.

The late 1960s were a pivotal time for ARL. In 1967, Hooper stepped down and Larry Neale became the lab's third director. Military work pretty much came to an end. The nation was undergoing a fundamental change. Protests over the war in Vietnam were raging, and no longer was it fashionable for colleges to be associated with building the tools of war. Gone were the days when a college could proudly send out a news release (as WPI did) heralding the fact that it was helping the Navy design "more deadly and accurate weapons of offense and defense."

The following year, 1968, the new flow meter facilities were dedicated and calibration work expanded. In that field, ARL was now virtually in a class by itself; few if any could match it in size or quality.

Also around this time, the lab, which had always been part of the Mechanical Engineering Department, became an independent department.

By the 1970s, ARL's reputation had spread and the lab now had more work than it could handle, much of it because of expanded plans for nuclear plants and, at the same time, growing concern about the environment. There was a rash of thermal-discharge model studies. During those peak years, as many as 60 people were on the ARL payroll—a far cry from earlier decades when from six to 12 employees staffed the lab.

Also during this period, the lab underwent a subtle but fundamental change, the seeds of which were sown as early as the late 1960s. Few probably noticed it at first, but an era that had begun in 1894 was ending. No longer could things be run informally. The days of contracts okayed with a handshake or a phone conversation were gone.

Larry Neale, who resigned as director of ARL in 1975 after a nearly 40-year tenure at the lab, has memories of the past that illuminate the present. "I remember vividly the years when three or four of us would sit around the fireplace in rocking chairs discussing the day's work. We were often paid out of Allen's personal checking account or from checks from clients.

"And in those days, everyone did everything—concrete work, carpentry, digging, you name it. There were times when everybody except Mrs. Lawrence, the secretary, was down pouring concrete."

The change to a more structured organization (the lab now consists of four divisions: Applied Fluid Mechanics, Open Channel Hydraulics, Flow Measurement and Machinery, and Research and Devel-

opment) was less the product of a conscious decision on anybody's part than a response to the demands of a changing world. Equipment was more sophisticated and more expensive. Clients were demanding formal proposals and complex contracts. Time became more of a factor. So did liability. This last issue would escalate until, for a time last year, there was serious thought given to making ARL an independent organization.

George E. Hecker, who took over as director when Neale left, explains: "Because so much of the work we do is applied by the client to a 'product,' if you will, we could be held responsible if something should go wrong. And, in the case of a nuclear power plant having to be shut down, for example, the cost implications would be tremendous." Ultimately, reasonably priced liability insurance rates were secured and the crisis was averted.

By about 1980, the pendulum had swung again and research contracts at Alden declined. A number of things contributed to the slowdown. Cost overruns and public fear over the Three Mile Island incident had virtually halted the construction of new nuclear plants. In fact, few power plants of any kind were being built.

"The recession forced a reduction in power demand," says Neale, now chief hydraulic engineer for the Boston firm of Charles T. Main. "Fewer factories were running, and there was little new construction. There was simply no need for new power facilities."

Neale also points to increased competition on the international market. "There is model study work now being done in developing nations like Pakistan and Argentina that could be done faster and better at Alden. But these countries want their own people to learn how to run things."

ARL is located on 20 wooded acres in Holden, MA, five miles from WPI.

Pure research contracts continue to fund a fraction of the lab's activity but, as Hecker points out, ARL is at somewhat of a disadvantage in this area: "NSF and others who fund basic research lean toward facilities that are staffed with a full-time academic faculty." ARL's competition in this category comes from schools like the Iowa Institute of Hydraulic Research at the University of Iowa, the St. Anthony's Falls facility at the University of Minnesota, California Institute of Technology and Massachusetts Institute of Technology.

Student participation at ARL, too, has declined. For years, all civil and mechanical engineering majors did lab work out at Alden as part of their required course of study, but student interest in hydraulics and fluid mechanics has always been cyclical. In the 1950s a general decline in interest in the laboratory aspect of education cut the numbers. Then, during the early to mid-'70s when the lab was very busy, there was renewed student interest. As many as 15 graduate and 30 undergraduate students were doing work at ARL. Currently, there are just one graduate student and a handful of undergraduates.

The current decline in students at Alden is, at least partly, traceable to a changing world.

"Students have a lot more choices now," notes Neal. "With electronics, computers and other new fields, there's simply more competition for a student's time."

William W. Durgin, who was at ARL for about 12 years before leaving to become a full-time ME professor at WPI, points out the contributions students have made over the years.

"Students conduct studies and contribute ideas that are of great help. They helped WPI carve out a special niche. And, from a practical point of view, students working on master's theses can do a big chunk of work for a small amount of money. But the greatest asset is the vitality and boundless energy of students."

Another change at ARL is a greater emphasis on computer modeling of flows. A more powerful main computer was recently installed to allow sophisticated simulations like the one done of the Lantao Bay in Hong Kong.

Field studies have also increased, especially for flow measurements in power plant cooling systems and hydro-power stations. Many such measurements use the dye dilution method, a process ARL recently improved to the point where accuracy is on the order of one percent. Such pinpoint measurements allow plants to improve efficiency, which takes on greater importance now that few new plants are being built.

In the physical modeling area, interest in renewable energy sources has resulted in several ARL studies of "low head hydro" projects, which produce electricity from rivers with large flows but relatively low height water drops. In this category would be the many regulating dams on the Ohio and other great U.S. rivers.

Flow measurement at ARL, which traditionally has represented about 25 percent of the lab's work, is still going strong. Al Ferron reports he is booked several months in advance.

As for the future, one thing's for certain: coming trends are virtually impossible to forecast. Some predict a serious power shortage in the next decade if new plant construction does not pick up.

"There are great fluctuations in this business," says Assistant Director Brocard, "and we often end up having either too little or too much work. But that's one of the exciting things about it."

As ARL turns 90 and looks toward its centennial, no one is really sure what the lab will be like 10 years down the road. Whether you consider that to be exciting or disconcerting is akin to seeing the proverbial water glass as either half full or half empty.

It's clear, however, that the lab has always rolled with the punches and changed with the times. The smart money says the glass is half full.

Michael Shanley is Director of the WPI News Bureau.

A Lab By Any Other Name...

If you think you've noticed something peculiar about references to Alden Lab over the years, you're right. The place has had four different names: Hydraulic Testing Laboratory (1894), Alden Hydraulic Laboratory (1917), Alden Research Laboratories (1965) and Alden Research Laboratory (1977).

FACULTY FAVORITES

We all read in our spare time—newspapers, magazines, books, billboards. For most of us, the paper we thumb through would add up to a small mountain were we to collect it over the years. And when it comes to books, there may be one or two whose reading leaves us with a special message that we carry with us—for life.

Ever wondered which volumes affect professors in this way? We did, so we invited WPI's faculty to tell us about their favorite books. What we found was that the books faculty read on their own time are as often as not far afield from their professional specialty, yet their selections may tell us a lot about these folks as people outside the classroom or laboratory. The assortment embraces fiction and non-fiction, technical and biological works.

One thing is clear: the faculty whose book reviews follow were moved by their readings. We offer these critiques for your own reading pleasure as well as, perhaps, to offer you candidates for your own reading list.

Computer Power and Human Reason: From Judgement to Calculation

by Joseph Weizenbaum
W. H. Freeman and Co.,
San Francisco, 1976

The Computer Science Department offers a course entitled *Introduction to Artificial Intelligence*. When people first hear this, their reactions often take the form of either amusement or skepticism. People unfamiliar with computers are amused and ask, of course, whether we accept people with natural intelligence. People with some computing experience express similar amusement until they realize that I am serious, then they display a strong skepticism. "How can the idiot machine ever do anything remotely resembling intelligence? I have programmed computers before, and I know that there's not a breath of intelligence in those things."

James M. Coggins

Computer Power and Human Reason is a book written by an Artificial Intelligence (AI) researcher (Weizenbaum is a professor of computer science at MIT) arguing against some of the directions being taken in AI research. Weizenbaum does *not* doubt the potential of computers to behave intelligently. His careful discussion of the power of computers is at least enough to convince the reader that there is more to computer science than programming languages, programming techniques and advanced programming, a common misconception among WPI students (and faculty, if the truth be told).

Weizenbaum's conflict is over the ways in which AI technology should be applied to human problems. His position is, at one level, that computers should not be used in certain situations (psychotherapy, for example) even if they can be programmed to simulate a human in that situation, because many of our problems are uniquely human in origin and need uniquely human solutions. We are what we are partly because we must grow up, because we have two legs, because we have a thumb, and because we hold certain views of the world. Weizenbaum argues that no computer, no matter how advanced, can or should be expected to act with the wisdom and understanding needed to satisfy uniquely human needs.

On another level, however, Weizenbaum seeks to awaken scientists and non-scientists alike to what he calls the "imperialism of instrumental reason." The thought process that we denote by the terms "decide," "deduce" and "compute" has become the accepted mode of "rational" conversation and argument—one based on calculation. To express "beliefs" or "feelings" or to make "choices" or to have "hunches" is no longer an acceptable basis for ideas—we have begun to denigrate human judgment. If we limit our consideration to calculation, then the computer will soon join us as a calculating, rational thinker. Weizenbaum argues that we must not ignore or dismiss the process of human judgment as a basis for valid ideas. (For further reading, see "The Causes of Wars" by Michael Howard in the *Wilson Quarterly*, Summer 1984, in which the author attributes war to a "superabundance of analytic rationality".)

Computer Power and Human Reason is not an easy book to read, but it is an important one, though Weizenbaum's tendency to wax metaphysical sometimes obscures cogent points. This is not the work of some irrational pseudo-philosopher, but of the creator of ELIZA, one of the earliest AI programs. Nor is it the work of an anti-technology pseudo-intellectual. Weizenbaum has no doubt that computers can in principle behave "intelligently." His argument concerns the desirable limits of the application of this technology.

—James M. Coggins
Assistant Professor of Computer Science

Too Long a Sacrifice: Life and Death in Northern Ireland

by Jack Holland
Penguin Books, New York, 1982
Hardcover published by
Dodd, Mead & Company, 1981

In the early 1960s synthetic fabrics and Japanese steel undermined the linen and shipbuilding industries of the six provinces of Ireland that are still part of the United

Michael Carroll

Patrick P. Dunn

Kingdom of Great Britain and Northern Ireland. Realizing the need for industrial modernization, Terrence O'Neill, elected Prime Minister of Northern Ireland in 1963, began mobilizing talent regardless of race or creed, building bridges to the Catholic minority of Ulster. After all, he explained, "If you give Roman Catholics a good job and a good house they will live like Protestants because they will see neighbors with cars and television sets."

For many of the Protestant majority, O'Neill's "language of modernization" meant "sell-out." Followers of the Presbyterian Minister Ian Paisley responded with a campaign to execute known members of the Irish Republican Army. No IRA member was executed, but an elderly Protestant woman was killed, a drunk shot, and a bar blown up before the violence subsided.

In response to O'Neill's initiative, Irish Prime Minister Lemass signed an agreement to pursue matters of common economic interest. And back in Northern Ireland efforts were made to end discrimination against Catholics in employment, housing allocation and political redistricting.

In England, meanwhile, Labourite Harold Wilson, who had once called the ruling Unionist Party in Ulster "quasi-fascists," was Prime Minister. To Paisley and his followers, it seemed as if the IRA dream of a united and independent Ireland with an overwhelming Catholic majority might yet be realized. They organized to counter local civil rights rallies, culminating in the August 1969 "Battle of the Bogside," which brought in British troops.

The IRA played no role in these conflicts—indeed in the Catholic ghetto "IRA" stood for "I Ran Away." But from the ashes of burned-out Catholic ghettos arose the Provisional IRA, with its symbol, appropriately, a phoenix. Thus began the current round of "troubles" in Ulster.

Author Holland, of mixed Catholic and Protestant heritage, chronicles and analyzes events from 1969 to 1982. A journalist by training, he blends personal experiences with interviews and written accounts. In the end he condemns the violence wrought on the population by all sides of the struggle.

While not ignoring history, Holland stresses how the current situation differs from the past. The IRA of history was a rural-based guerilla army recruited from poor farmers steeped in conservative Irish culture. The soldiers of the Provisional IRA are urban youth, educated, many with service in the British army, underemployed, frustrated, and with liberal to leftist political ideals. They confront a Protestant majority whose identity has been weakened by economic decline and English betrayal (home rule in Northern Ireland was abolished in 1972).

Holland concludes, "It would seem reasonable to suggest a look at other kinds of political and economic relationships between Belfast, London, and Dublin which would satisfy the national aspirations of the vast majority of the Irish people while at the same time giving protection, and some degree of autonomy, to the local, northeastern Protestant population." For, as Yeats wrote over a half century ago, it has already been "too long a sacrifice . . . O when may it suffice?"

—Patrick P. Dunn
Associate Professor of History

Michael Carroll

Laura Menides

Everything That Rises Must Converge

by Flannery O'Connor
Farrar, Straus and Giroux,
New York, 1965

Flannery O'Connor was working on her volume of short stories, *Everything That Rises Must Converge,* when she died in 1964 at age 39. Like her two novels *Wise Blood* and *The Violent Bear It Away,* these stories are remarkable—imaginative, comic, even bizarre, yet spiritual and deeply, humanly true. Surely they rank among the masterpieces of American literature.

The title story of *Everything That Rises Must Converge,* like most of O'Connor's fiction, takes place in the American South shortly after desegregation had become the law of the land. The story at first seems a simple tale of a clash between generations, a typical mother-son conflict, she clinging to old-fashioned ways and he college-educated and modern. The son finds his mother burdensome, and we readers are apt to find her so as well: her silly talk of her new hat, her exercise classes with other "girls over fifty," her fond memories of her genteel, white Southern upbringing, her condescending attitude toward blacks, whom she calls "darkies," her conviction that things were better for the black race before desegregation. The son, Julian, thinks (and again we tend to agree) that she needs a lesson, and that justice has triumphed when she undergoes a series of humiliations on a newly integrated bus, culminating when a black woman comes aboard wearing a hat identical to his mother's. Julian's gloating becomes excessive, however, as does the anger and verbal abuse which he directs at his mother.

We begin to question our earlier identification with him—we might even be ashamed of it—as we see how limited and

insensitive he is, how pompous, how superior he thinks himself, how condescending toward his mother, and how cruel. Julian's own realization comes late, at the dramatic ending of the story, when, stripped of his sense of superiority, he is ready to enter "the world of guilt and sorrow."

Without being the least bit preachy, O'Connor's story has a profoundly religious effect on readers, for it suggests not only the Fall of Man, but also the need for grace and redemption. Like all great literature, it makes us feel and think deeply; it helps us discover what it means to be human.

—Laura Menides
Assistant Professor of English

The Poems of W B Yeats

Edited by Richard J. Finneran
Macmillan, New York, 1983

Michael Carroll

Lance Schachterle

William Butler Yeats (1865–1939) is arguably the most important poet to write in English since the Great Romantics, whose ideas he perpetuated and developed further. Unlike the Great Romantics, however, Yeats remained fully vital as a citizen and poet throughout his life.

Perhaps Yeats's greatest achievement was always to remain open to new sensations, new opinions, new ideas. Early (as in "A Coat") and late (as in "The Circus Animals' Desertion"), he proclaimed the need to return to everyday human experience—"the foul rag and bone shop of the heart"—as the basis of a poetic art that would not lose touch with the common reader.

He mastered all the techniques of his trade in his twenties, and by mid-career he had brought to perfection the rhetoric of 19th-century Romantic poetry—mythological allusions (both to Irish and classical sources), nature descriptions infused with a sense of spirit, and the universalizing of his own experience. Yet his greatest strength was always to suspect and subvert that very rhetoric. Thus he avoided the fate of the later Wordsworth or Tennyson, for whom the sound of the language came to outweigh its sense.

Yeats's life spanned a turbulent period in history—from the end of our Civil War to the outbreak of World War II. As a young man, though, he grew up at the end of the Victorian era, when many expected the new commerce and technology to ensure world stability. World War I came as a terrible disillusion. As he wrote in his great war poem, "Nineteen Hundred and Nineteen":

The night can sweat with terror as before
We pieced our thoughts into philosophy,
And planned to bring the world under a rule,
Who are but weasels fighting in a hole.

Yeats recognized that by nature he was contemplative rather than actively outward-going, leading him to fear the constriction of too narrow a range of experience. Thus from 1900 on, he forced himself to pursue a life of public activity and service. His poems on the Irish Civil War provide a moving record of his despair over the apparent death of Irish patriotism ("September 1913"), his recognition that his loss of hope was premature ("Easter, 1916"), and his shock over the outrages of the Civil War itself ("Meditations in Time of Civil War"). And when the Irish Republic was proclaimed in 1922, he accepted the burdensome responsibility of becoming a member of the first Senate, where he applied his considerable skills in prose to arguing public policy in areas like copyright, coinage and divorce. In 1923 he won the Nobel Prize for literature. Reputedly his first question was: "How much does it pay?"

This new edition of all of Yeats's published poems—and many he did not collect in his various reprints—provides accurate, clear texts with helpful notes by both Yeats and the editor, Richard J. Finneran. The poems are presented in the order which Yeats himself devised for his own various collected editions, an important feature since Yeats often juxtaposed lyrics to contrast or expand upon his central themes. This handsome and reasonably priced volume thus provides the full record of Yeats's career as a poet, and many helpful explanations of his personal references to historical and political figures. It is a wonderful way to get to know the work of Ireland's greatest poet.

—Lance Schachterle
Professor of English

The Big Sky

by A. B. Guthrie, Jr.
William Sloane Associates, New York, 1947

Most historical novels contain all the elements of a painting by Pieter Brueghel—

John Van Alstyne

lots of color, action, and people. A. B. Guthrie, Jr.'s *The Big Sky* is painted in more subtle hues. This is the work of a consummate storyteller, one who can sustain the reader's interest even though the emphasis is more on creating a mood than on providing action. The novel deals with that extraordinary band of mountain men who explored and understood a virgin West before the coming of the wagon trains. But it is more than just a story. It is an elegy for a wilderness of both utter beauty and stark raw nature, written by a man who was reared in Montana in the early part of this century.

The story begins in 1830 when the protagonist, Boone Caudill, flees his home in Kentucky and heads west to trap beaver. In St. Louis, he meets one of the first mountain men, Dick Summers, and together they head northwest into the Rocky Mountains. There is a fascination in the contrast between the raw, uneducated, angry young man, at odds with life forces seemingly beyond his control, and the older experienced hunter, wise in the ways of survival, who has found a way of life that has given him an inner serenity. There is no happy ending here. The time of the mountain man spanned only slightly more than two decades in our country's history. By 1843, the time setting for the final chapters, both men knew the days of freedom from civilization were fast coming to an end.

Perhaps because of the contemplative nature of this work, *The Big Sky* never attained a success commensurate with the almost universal critical acclaim it received when it was published in 1947. Guthrie's next book, *The Way West*, packed with the people and action of a wagon train heading for Oregon, won the Pulitzer Prize in 1950. Yet for me at least, *The Big Sky* is a book to be cherished and reread by anyone with a love of nature and an interest in the history of our country.

—John van Alstyne
Dean of Academic Advising

Confessions of an Actor Laurence Olivier

An Autobiography

Simon and Schuster, New York, 1982

Ask anyone of this century to name *the* actor of the century, and I would wager most people would say Laurence Olivier.

Confessions of an actor. Intriguing. Yet

Michael Carroll

Susan Vick

other actors have confessed: John Barrymore (whew!), Shelly Winters (did she ever!), Marlon Brando (who told his story to someone else), Shirley MacLaine (again and again), and many more (though few as sensationally as these named). Yet none, I dare say, would compare in greatness to Olivier! Therefore we could assume that his confessions would (Hopefully? After all he was married to the notorious Vivien Leigh) be greater than the others': He must have drunk more than Barrymore, sworn more than Winters, caroused more than Brando, been reborn more than MacLaine.

Yet his confessions seem rather ordinary. Nothing truly sensational leaps from his pages. Maybe history would be spicier had he told someone else who then could have written the "confessions" for him. But, oh! What we might have lost had Olivier succumbed to the lure of the luxury and ease of having someone else write (sensationalize?) his book for him. For, in the process of writing this book, Sir Laurence struggles—to express his ideas, his emotions, to recall his memories accurately. No one has led him away from him. What he gives us is pure Olivier—maybe not spicy, maybe not easy reading, and some of it, perhaps, downright drudgery to get through (not much of it). Yet his words ring so true that we may rejoice to hear confessions that so clearly and directly come from the greatest actor of our time.

I'm asked the question, from time to time, by people outside the theatre profession: "Is Olivier really that good?" It's hard to believe he's as good as we all say he is. Yet we may have begun to take his great talent and wonderfully developed skills for granted: hard not to do with someone who as an actor has been in our films, on our stages, and upon our picture tubes for almost as long as many of us have been alive.

My question has never been: "Is he that good?" I always knew that he was. I'd been haunted by his Heathcliffe since I first saw "Wuthering Heights" in virtually the same year I found out the truth about Santa Claus. I've driven over a hundred miles to see his Max de Winter in "Rebecca" without commercials on the big screen. His "Richard III" sparked my intense and eternal interest in Shakespeare. And his performance in "Marathon Man" kept me out of the dentist's chair for too many months!

My question always has been: "Can someone who can absorb and project so many characters so completely be a complete person of his own?" Indeed he can. Look no farther than his confession of a debilitating almost six-year stage fright so great that, when he performed Shylock, he did "something that I knew went against the conscience of all of us who had worked so long for a genuine company spirit: I asked them not to look me in the eyes in any of my scenes." Enjoy the richness of his faith in, and love for, his dear friends, and relish the stories of them:

> I got my dearest old friend on the phone one day and asked him, "Ralphie [Richardson], be an angel and think a minute for me"—there's a friend. "Should I go to Hollywood and play Heathcliff in 'Wuthering Heights'?" Ralph obligingly thought for a moment and then said, "Yes. Bit of fame. Good." For some reason I had the greatest misgivings about the offer, but after that mini-colloquy I didn't have them any more.

He was not above a prank or confessing to the resultant reprimands by theatre managers early in his career, nor does he find anything unsophisticated in arriving at astonishingly simple conclusions: "Shakespeare could look after himself and look after, too, the actor who trusts him."

Olivier lets us know that the greatest can also be the most human. My question has been wonderfully answered with a resounding: "Yes!" And although Sir Laurence takes us through some dry spells, the profound insights into life, love and the acting profession which he gently yet persuasively offers us throughout his

Confessions give stunning proof of the power of *true confessions*.

—Susan Vick
Assistant Professor of Drama-Theatre

Powerline: The First Battle of America's Energy War

by Barry M. Casper and
Paul D. Wellstone
University of Massachusetts Press,
Amherst, MA, 1981

and

Love Canal: Science, Politics and People

by Adeline G. Levine
Lexington Books, Lexington, MA,
1982

In recent years there has been a considerable increase in the general level of awareness about potentially serious side effects of technological development. Yet while the environmental and public health portions of these studies have started to reach a reasonable level of sophistication, the social impact sections are generally quite crude. It is therefore noteworthy that social scientists have begun to conduct case studies of well-known incidents. Sociologist Adeline Levine's study of *Love Canal* and the account of political scientists Casper and Wellstone of the siting of a *Powerline* in rural Minnesota are two such accounts.

In keeping with the traditional interests of social scientists, each account focuses on the development of a politically significant social movement at the grass roots level. Each resistance was sparked by a perceived threat to the homes of those directly involved. Both trace the process by which average citizens become politicized and gradually learn how to mobilize influence. There the similarities end, however, as the groups involved and the settings differ greatly. One wins; the other loses. One resists the creation of a potential threat, while the other finds out that they are victims after the fact.

Powerline involves a resistance movement by rural farmers who are led slowly to set aside their law-abiding instincts to mount an all-out effort to stop the proposed construction of a high voltage D.C. powerline across their cropland. The fury of the farmers takes them from open debate and mass demonstration to passive

Michael Carroll

John M. Wilkes

resistance and harassment, to open confrontations with the police and outright acts of sabotage. In a final desperate effort to take back control of the apparatus that seemed to be oppressing them, they run a candidate for governor—and garner a third of the statewide vote. Though they fail to stop the line, they so alter the social and political atmosphere in the state that the authors consider it unlikely that another such line could be built in Minnesota during the remainder of this century.

Bibliographic sketches of key resistance movement figures give the account special shock value and integrity. We learn that some of the leading farmers totally committed to preserving the land as a sacred trust are actually technically trained individuals—with sojourns at places like Raytheon and the Bureau of Mines—and some with advanced technical degrees dotting their resumes. They are really technical dissidents raising a challenge to the way of life they left behind.

Love Canal chronicles the troubles of the residents of a working-class neighborhood in Niagara Falls, who awaken to the fact that their school is built on top of an abandoned chemical dump "sold" by the Hooker Chemical Company to the city for a dollar and a waiver of responsibility. Subsequent construction of houses, roads and sewers had perforated the original clay cap, and a witch's brew of toxic chemicals was leaking through the neighborhood underground.

On finding that they might already have received serious exposures to carcinogens, as well as suffered a range of immediate physical discomforts, and a miscarriage rate several times the national rate, the residents organized an increasingly media-wise political campaign to get enough of an indemnity from the state to allow them to abandon their contaminated and worthless homes. The main portion of the account involves the process by which they organized themselves to press their demands on a political apparatus greatly concerned about setting precedents that would involve the state in a quagmire of open-ended legal and financial commitments. The cost has exceeded $68 million to date.

These dramatic cases gave social scientists ample opportunity to explore classic sociological and political themes. They also presented a golden opportunity to assess the promise of classical social science methods and perspectives for the study of technology. Yet their opportunity is at best only partially realized. It is unfortunate that the structure of Casper and Wellstone's account does not provide much latitude for post-hoc analysis of technology issues not anticipated by the authors. The *Powerline* case had great potential, but methodological problems limit what can be done with the account beyond its immediate purpose of chronicling the development of the opposition movement.

Levine's greater familiarity with the canons of qualitative analysis, and the observer's role, along with her self-conscious application of cross-validation techniques, helped her to produce a more balanced account of the incident in its social context. (Casper, who we discover had run for state office on the movement's party ticket, was not as careful in this regard and became a full participant in the movement.) The result is that Levine produces a more credible and objective account, despite the fact that both Casper and Levine side with the citizens' groups in the end, and both focus their primary attention on their respective movements, tactics, successes and failures.

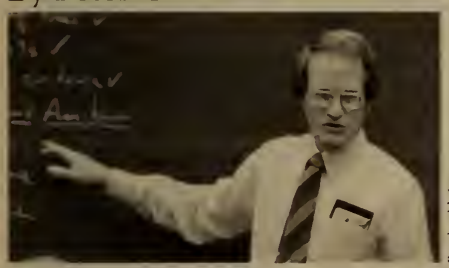
These books demonstrate that the qualitative side of social science has much to offer those interested in technology assessment and impact analysis. Unfortunately, much of this promise will remain a potential rather than an actual contribution unless concerned technologists with inside information about the basis for technical decisions start to produce high quality accounts of this kind or team up with social scientists determined to test and cross-check their perceptions systematically.

—John M. Wilkes
Assistant Professor of Social Science & Policy Studies

WHY TEACH?

Teaching is a red-eye, sweaty-palm, sinking-stomach profession, says an experienced university professor. What keeps him teaching?

By Peter G. Beidler



Bernhard J. Suess

Peter G. Beidler, Lucy G. Moses Professor of English at Lehigh University, was named 1983's Professor of the Year by the Council for Advancement and Support of Education (CASE). A Chaucerian scholar, he is back at Lehigh this fall after a year's sabbatical in Canterbury at the University of Kent where, among other things, he wrote a book about Henry James's *The Turn of the Screw*.

Why do I teach, my friend asked? I had just told him that I did not want to be considered for a certain university administrative position. He was puzzled that I did not want to realize my full potential by becoming a serious candidate for what was obviously a "step up," an opportunity to achieve what all American boys are taught to want when they grow up: money and power.

It may be, of course, that I teach because I never did grow up. It may be that, as I approach too rapidly my 45th birthday, I find a strange comfort in spending my life among other adolescents who have not yet jumped onto the great upward treadmill. I confess that my favorite students are first-semester freshmen: a little afraid, awed by the prospect of *really* learning, thrilled to be treated like adults for the first time in their lives, yet willing to admit in a candid moment that they really do not *feel* like adults. I like those first-semester freshmen because, at least early in the semester, no one has yet told them about things like rush, all-night parties, guts, and how to get through college without learning much.

It may be, then, that I teach because I feel at home in the company of people who feel a sense of wonder—almost fear—about learning, who have not yet quite grown up, and who are not entirely sure they will be safe when they have. But surely that is not the only reason I teach. I have grown up. I have no desire whatever to be a first-semester freshman again. I am happy to leave the uncertainty and frustration of being 18 to those who are 18. Why, then, do I teach?

My friend did not really want to know why I want to stay in teaching. He had more important things on his mind. But *I* want to know. And if I cannot write it down, I do not know it. So here goes.

Let me try to be what I tell my freshmen writers to be: organized. First, I shall discuss some of what are not the reasons why I teach. Then, I shall try to sort out some of what are the reasons.

I teach not because teaching is easy for me. Teaching is the most difficult of the various ways I have attempted to earn my living: bulldozer mechanic, carpenter, university administrator, writer. For me, teaching is a red-eye, sweaty-palm, sinking-stomach profession. Red-eye, because I never feel ready to teach, no matter how late the night before I stay up preparing. Sweaty-palm, because I am always nervous before I walk into that classroom, sure that I will be found out for the fool that I am. Sinking-stomach, because I usually walk out of the clasroom an hour later convinced either that my fly must have been unzipped the whole hour, or that I was even more boring than usual.

I teach not because I am a natural-born public speaker. I tend to mumble my lectures, fumble my facts, jumble my jokes, and stumble my interpretations.

I teach not because I think I know answers, or because I know a body of information I feel driven to share with others. I occasionally take a look at my teaching notes for a work I taught several years earlier and am appalled at what I see. Did I really say *that* about the pink ribbon in "Young Goodman Brown"? *Surely* I did not tell my Chaucer students that Chaucer's Prioress is frustrated because as a nun she could never have babies. To think that my students sometimes actually take notes on what I say in class!

I teach not because I look handsome in front of a class. I look like someone who had Ichabod Crane for a father and Prudence Pimple for a mother. I have bad posture, thick glasses, and thinning hair that sticks out at funny angles. As my sons never tire of telling me, I wear untrendy clothes, even (shudder) flares. Robert

Redford would look natural in front of a class. I look like something that the mower just kicked out from a damp lawn. Someone videotaped me once as part of a "teacher self-improvement" project. I wanted to improve, but I could not bear to watch to the end of the video replay over in the media center. It was no fun seeing myself as others had to see me.

Why, then, do I teach?

Come to think of it, there are lots of reasons why I teach. I teach because I like the pace of the academic calendar. A crass way of putting it is to repeat what one sardonic teacher replied when asked why he taught: "I teach for three reasons: June, July, and August." I like June, July, and August myself, but less because they get me out of teaching than because they offer a change of pace, an opportunity to mix rest, reflection, research, and writing, all key ingredients in my recipe for teaching. It is not that the summers are less effort. It is that they are different effort.

I teach because teaching is a profession built on change. Even when the material I teach is the same, *I* change from semester to semester, and, more important, my students change. No two classes of students are alike. If I read *Moby-Dick* one way this year, I'll read it another way in two years. If I do read it the same way, William and Sally in 1984 will be replaced by Thomas and Heather in 1986, and different students make the novel a different experience for all of us who are talking about it.

I teach because I like the freedom to make my own mistakes, to learn my own lessons, to stimulate myself and my students in ways that seem right to me at the time. As a teacher, I am my own boss. If I want—as I did several years ago—to try a creative writing course in which my students analyze *Redbook* magazine to see what kind of fiction the editors are buying, I can do it. If I then want to urge my students to try to write for publication in *Redbook*, I can do it. I do not have a boss telling me that I must teach my students to write like William Faulkner. And if, as in the current semester, I want to teach a freshman composition course in which my students learn to write not by reading someone else's textbook, but by writing their own, well, who is to say I may not do it? The course may be a colossal failure, but we can learn—and our students with us—from colossal failures.

I teach because I like to ask questions. Although I am often uncertain about whether I know worthwhile answers, and am usually undistinguished as a lecturer giving students information, I think I have gotten better at asking questions which are good for students who struggle to answer them. The world is full of the right answers to bad questions. I teach because in doing so I sometimes brush up against good questions. This fall, for example, I asked my freshman writing students to write an essay not about the food in the university dining room, but about the loneliness only a freshman in the first week away at college can understand.

I teach because I like to learn. Indeed, I stay alive as a teacher only so long as I am learning. One of the major discoveries of

my professional life is that I teach best not what I know, but what I want to learn.

There was a time some years ago, for example, when I wanted to learn about the role of the American Indian in our American literary tradition. I learned by teaching a course on the subject, by taking some students with me on a pathway of discovery. That particular pathway, incidentally, was to lead me to a postdoctoral fellowship in anthropology at the University of Arizona, and later to a sabbatical year living with my family on the Hopi Indian reservation in northeastern Arizona. And, just last year, the pathway led to my taking another class of students back with me to the Hopi reservation to interview some Hopi people. None of that would have happened had I not set off on a quest for knowledge by teaching a course on something I knew almost nothing about.

I teach because I enjoy finding ways within an ivory-tower profession to get myself and my students out of the ivory tower from time to time and into the so-called "real world." I have already mentioned the *Redbook* course and the Hopi course. Perhaps another example will show better what I mean. In 1976 I taught a course called "Self-Reliance in a Technological Society." It was in some ways a normal enough ivory-tower kind of course. My 15 students read writers like Emerson and Thoreau and Huxley. They kept journals. They wrote term papers.

But there was a less normal aspect of the course. My students and I also set up a corporation, borrowed money from a local bank, purchased a run-down house on Vernon Street near the university, and spent "lab sessions" during the semester practicing self-reliance by completely renovating the house. Then, at the end of the semester, we sold the house, repaid our loan, paid our corporate income taxes, and distributed the profits among the students. Certainly this was not your average English course. To some people it seemed more appropriate to a vocational-technical high school than to a respectable institution of higher education. But 15 future

PETER BEIDLER ANSWERS A FEW QUESTIONS ABOUT TEACHING

How much freedom do you give your students to cut your classes?

Not much. I generally require attendance. Occasionally something magical happens, and I want my students there both to experience the magic, and to make the magic happen. I let students call me by my first name, but I don't let them whisper among themselves or read newspapers in class. That is an insult to me and to the other students, and I see no reason to encourage insulting behavior. I let them sleep in class, if they will. It is their job to get to class; it is my job to make it worth their while staying awake.

So teachers should be entertaining?

Entertaining is fine, if it comes naturally to a teacher, and if he or she can be entertaining without forgetting that teaching is essentially a serious business, demanding serious thought about difficult subjects. I have always liked teachers who were enthusiastic about their subject better than those who entertained in less honest ways.

How do you prepare for your classes?

Long and late. I try to think of every question that will bring from my students answers they will remember. But I try to keep in mind also certain basic points or subjects I want to make sure my questions bring out.

What effect do you think television has had on education?

A generally depressing one, I am afraid. It is not merely that young people who are watching television are not reading or making their own entertainment. It is more that television trains viewers to receive rather than give, to observe rather than participate. Oh, I am aware that there are many fine "educational" programs on TV. Education is not something one observes, however; it is something one *does*. And just as I seldom lecture in my own classes, so I seldom see a television program that involves viewers in the wonderfully active process of learning. I'd rather a child wandered for one day in the wilderness than watched a documentary on the migration patterns of deer.

Are there any unpardonable sins in teaching, any sins which students ought not to forgive?

Lots. One is laziness. Students know when a teacher is not working hard at teaching, and rightfully resent it. Another is being bored and boring. Learning is the most exciting thing in life, next perhaps to falling in love. A third sin grows out of the other two: Teachers who think that teaching is merely a question of conveying what they have learned are probably both lazy and boring. Teachers who have forgotten what the thrill of discovery feels like ought to go—at least temporarily—into a new field where they are forced to experience that thrill firsthand.

Do good teachers also need to be good publishing scholars?

Teaching and scholarship are intimately related. Both teachers and scholars need to know how to ask good questions and offer sensible answers. Both need to know firsthand the thrill both of discovery and of introducing new concepts to strangers. The best teachers I have had—Wayne Booth and Burke Severs—have also been the most solid and steady scholars. Most teachers who get stale in the classroom are also stale as scholars. They have stopped discovering.

lawyers and accountants and English teachers and industrialists, many of whom had never had a tool in their hands before, suddenly found themselves reading Thoreau's *Walden* with fresh eyes. They knew why Thoreau went to the woods, how he built his cabin, and why he felt so good about his experiment that he wanted to tell the world about it. They also knew why, in the end, he left the woods and the cabin to try other ventures. He had tasted the waters of Walden Pond. It was time to move on to other nectars.

I teach because teaching gives me many nectars to taste of, many woods to enter and then leave, many fine books to read, and many ivory towers and real world experiences to discover. Teaching gives me pace and variety and challenge and the opportunity to keep on learning.

I have left out, however, the most important reasons why I teach.

One reason is Vicky. My first doctoral student, Vicky was a somewhat noisy, enthusiastic, energetic young bubble who had trouble seeing past the thrill of literature to the rigor of academic scholarship. But she plugged away at her dissertation on a little-known 14th-century poet. And, while still in graduate school, she hammered out a couple of articles and sent them off to learned journals. And she started applying for jobs, entering a sluggish market in which the few job openings were both depressing and avidly sought after by the hordes of bright young PhDs who found them so depressing. Vicky did it all herself, with only an occasional smile or nudge from me, but I was there when she finished her dissertation, got word that those two articles were accepted, and landed her job. And I was there a couple of months ago when I got her letter saying she had won a National Endowment for the Humanities fellowship to spend a year at Harvard working on a book further developing some of the ideas she had germinated as a graduate student.

Another reason is Patti. Smart, opinionated, and brash, Patti raked in the A's, started up a local chapter of a national English honor society, went on to law school. Now a lawyer for the Department of Environmental Resources, she is still smart, still opinionated, and still brash as she gives industrial violators of the Clean Air Act a hard time. I was there the day she came into my office and told me about Rob.

There is Greg. Sensitive and creative, Greg majored in English as a stepping stone to becoming a novelist. I was there last fall when he wrote asking whether, bored with clerking in a bookstore, he would be making a mistake to apply for a teaching assistantship in a graduate English program somewhere. It does not matter that I told him if *I* really wanted to be a novelist, I would go to sea for a year. It does matter that I was there when he started asking himself the right questions.

There is Julie. Julie was sure she was not a good student, but her kids were growing up and she asked if she could sit in on one of my classes (but not for credit) to see if she was college material. I told her she could, provided she came to all classes, did all the work, and took all the tests. I was there when, right after the first test, she came in and, weeping, apologized because she knew she had failed it, even though she had studied for it night and day for two weeks. It does not matter that I later had the task of telling her she had gotten a low D, not an F, or that on the next test she got a solid B. It does not matter that in the end she decided against college after all. It does matter that I was there when she asked.

There is Jeanne. Jeanne used to sit cross-legged on the other chair in my office. She started to run away from college, but some of her classmates brought her back because they wanted her to be around when we all finished the self-reliance house on Vernon Street. I was there when she came back. I was there when she graduated.

There is George, who still sends me sardonic Christmas cards showing, for example, Santa Claus caught in a mouse trap in the pantry on Christmas eve.

There is Lois, who married a bee farmer and has three babies and is delighted that she majored in English.

There is Jacqui, a cleaning lady who knows by intuition more than most of us ever learn by analysis, who has just decided to finish high school and go to college.

There is Nadine, who needs to borrow $1,000 from each of 10 people to keep that little publishing company afloat.

These are the real reasons I teach, these people who grow and change in my presence. Being a teacher is being there, being present at the creation, when the clay begins to breathe. I take no credit for the moment of life, but I can think of nothing more exciting than being somewhere nearby when the breathing begins.

A "promotion" out of teaching would give me money and power. But I have money. As a teacher I get paid for doing the kinds of things I enjoy most: reading books, talking with people, making discoveries, and asking questions like, "What is the point of being rich?"

And I have power. I have the power to nudge, to fan sparks, to ask troubling questions, to praise an attempted answer, to condemn hiding from the truth, to suggest books, to point out a pathway. What other power matters? Who besides a teacher has so much power?

There is one other enticement that teaching offers besides money and power. It is love. Not only the love of learning and books and ideas, but also the love a teacher feels for that rare student, that one student who walks into the life of a teacher every year or two or three, that student whom teachers get to see begin to breathe. It is not romantic love, though it can easily be mistaken for that. It is not filial love, for these are not one's children. Perhaps love is not the right word for that sense of magic I refer to.

Whatever it is called, I teach because, being around people who are beginning to breathe, I occasionally find myself catching my breath with them.

CLASS ACTS

A look at four professors and their professorial methods—with borrowings from Socrates and closed-circuit TV—makes one thing plain: Good teachers are hard to define, easy to recognize.

By Joe Levine

Bill Denison

Walter Eppenstein, RPI

Bill Denison

Carlton Staples, WPI

Bill Denison

Robert Mansbach, Hartwick

Bill Denison

Nancy McDowell, Franklin and Marshall

WALTER EPPENSTEIN

He turns *Physics II* lectures into polished productions.

Sometimes a movie is produced so well that people say afterward, "I would have enjoyed it for the camera work alone." Walter Eppenstein's weekly *Physics II* lecture is that kind of show. It plays at Rensselaer Polytechnic Institute every day except Friday, and regularly draws a crowd of 500. It features the short, dark figure of Professor Eppenstein, conducting demonstrations at the front of the theater. It also features him on the two giant television screens hanging in the front wings. And on the four hanging from the ceiling way in the back, and the two that span the middle. Portions of him—his fingers, pointing a Venus No. 2 pencil at a series of equations—can also be glimpsed on four enormous overhead projector screens.

Eppenstein is not an egomaniac, he's a realist. In a lecture hall large enough to hold 500 people, a blackboard and a pointer simply won't do. Students need to be able to follow every step of the extremely complicated equations; to be able to watch experiments involving minute pieces of equipment. Eppenstein's projection of himself from every corner is done surely in the interests of accessibility.

But the sophisticated video equipment is, in another very important sense, a reflection of the man himself: he created it.

"You can't simply go out and buy educational equipment of this kind, because quite often it doesn't exist," Eppenstein says. "You have to design it yourself."

Thus even the one-time visitor to *Physics II* is assured of seeing Eppenstein's most important contributions to his field: the equipment with which he's teaching. He designed, and pioneered the use of, the large-size overhead projector, now commonly used in science lecture courses at colleges around the country. He was the first lecturer in his field, 25 years ago, to make use of "transparencies," projector slides of clear plastic, bearing equations written in brightly contrasting colors. He also developed a popular series of experiments for lecture hall use, and then miniaturized all the equipment so that it can be filmed by a closed-circuit television camera.

His students don't take the technology for granted. "The lectures and demonstrations are really easy to follow, and that's the most important part of the course," says Robert Seretny, '87. "He's even got a lot of the lecture material on file in the library, so that you don't miss anything taking notes."

Step into a lab section of *Physics II*, and you can see more of Eppenstein's handiwork. Each student's lab station is equipped with a microcomputer for instant tabulation of data; the microcomputers are in turn hooked up to a central Apple terminal that can analyze data for the class as a whole.

"We still make students run some experiments without computers, so they don't lose touch with what it is they're actually doing," Eppenstein says. "But obviously the computers save a great deal of time."

Eppenstein is that rarity among tenured faculty at any university: the professor who has devoted himself entirely to quality teaching. His research and publications are numerous, but nearly all are concerned with improved teaching methodology in

his field. In the list of his journal publications, titles such as "The Use of An Overhead Projector in Demonstrations before Large Groups" and "More Visual Aids for the Physics Lecture" abound.

"I've always felt that students should get the best possible teaching, because they're certainly paying enough tuition for it," he says. "Our department is a good one, in that it has some people who specialize in research and some who specialize in teaching. I've always happened to be good with teaching and people, so I've stuck with those interests."

Eppenstein, on first meeting, seems more the absent-minded laboratory physicist than he does the departmental hub of communication with students. He is short, bespectacled, and speaks with a German accent. He grew up in Turkey, after fleeing Hitler's government, and was educated at Robert College, an American institution there. He was originally an electrical engineering student; he got into physics when the college had a teaching position open in that department.

"Things just sort of happened that way," he says. "I have no regrets."

He came to the States in 1947 and took a job at RPI that same year. Since then, he has been increasingly involved with the quality of student life—and not just through his work on teaching aids.

"At this point, I wear a lot of hats," he says, somewhat ruefully. He is the director of *Physics II* ("One thousand students and 19 instructors need an arbiter for their differences, and I'm it."); director of advising and counseling for all physics students (last spring, he received RPI's Darrin award for counseling); special advisor to transfer students; supervisor of industry internships; and, to top it all off, associate chairman of the Physics Department.

"Budget-wise, that means I'm supposed to spend half my time on administrative stuff and half on academic," he says. "In reality, it works out that I spend three-fourths of my time on each."

Eppenstein, an evangelist for his field, is especially concerned about the ever-widening split between the sciences and the humanities. "These days, the average science student has some background in the humanities, or at least the ability to acquire some—but students in the humanities have less and less training in the sciences and, consequently, less ability to get any if they want to."

Along with other faculty at RPI, he has tackled the problem at its roots, outside the confines of the university, in the local public-school system. They've proposed to the National Science Foundation that the traditional high-school curriculum be reversed, and the idea is being tested at a high school in Troy. "We're having them teach physics in ninth grade, chemistry in tenth, and biology in eleventh, on the theory that this forms a better knowledge base," Eppenstein says. "We're also computerizing the lab experiments the way we have here, so students get a feel for that kind of equipment at a very young age."

But perhaps the most successful strategy the RPI physicists have employed in winning youthful converts is The Magic Show. "Every January, we give demonstration lectures to high-school students—we bussed in 1,500 of them this year," Eppenstein says. "The shows consist of typical physics experiments, but ones that look fairly spectacular to audiences." There are laser displays, nitrogen-dipped rings leaping off magnets at the flick of a switch to fly up to the ceiling, and rockets shot off across lecture halls. The shows have an immediate practical value: "Quite frankly, they keep the kids awake," he says. But they also bring some color and excitement into a discipline which, Eppenstein feels, too often neglects to convey what is exciting about itself.

"When I was younger, I always tinkered and built things on my own, but there was no teacher who ever really stirred my interest," he says. "I wish I'd been exposed to these kinds of demonstrations, but it was war time and the quality of the education just wasn't that good. When you learn a lot of things by memorizing, you tend to forget them, but you remember these shows years later."

CARLTON STAPLES

He is happiest when he can teach hands-on projects.

Bill Denison

Like medical students scratching their heads over their first flesh and blood patients, the aspiring engineers in *Mechanical Design Applications* have run into a problem beyond the scope of theory. A memo from "The Boss" directs each of them to submit a design for the same kind of speed gear reducer unit—a machine part which slows down a spinning shaft—that "The Company" has been buying for years for use in its pulverizing mills. (It seems the supplier has upped his prices.) The Boss wants the entire unit designed in the shop, with the exception of the worm and the worm wheel gears; these can be purchased from the buyer's catalog. The Boss means business: it is Friday, and he wants the designs on his desk at Worcester Polytechnic Institute by Monday afternoon.

"Oh, come on," groans Paul Furtado, '85, as he sweats over the drawing on his desk. "Sometimes I think half of what we've learned since freshman year doesn't apply in this course."

The Boss is not unsympathetic to this problem.

"I know it's a frustrating course for them," says Professor Carlton W. ("Spike") Staples. "It's the first time they've had to deal with practical problems after all the theory. They've gotten so used to plugging in formulas and getting exact solutions that they've forgotten how to use common sense."

Spike Staples is a softer boss than the hard edges of his name might suggest, and "Monday afternoon" readily becomes Wednesday for those having troubles with the speed reducer unit.

"He's tough and fair, and all that, but at heart, he's really a pussycat," one student says. "I don't think you'll find anyone who doesn't like him."

At 59, Staples still has a military crispness to his bearing (he saw active duty in World War II and Korea), but it is offset by the mild, amused air of a teacher who for 36 years has watched students grapple with their first "open-ended" problems. "Design is a gray world; it's not an exact science," he reflects after class. "So many of the decisions a designer has to make are on the basis of gut feeling. I can help students intelligently approach the choices they have to make, but I can't choose for them. In that sense, they're on their own, and it's tough."

On Friday, Staples takes the class through the different steps of designing the speed gear unit. There is no single right way to do it, and the important thing seems to be knowing what to think about when you choose. Efficiency and budget are the big concerns in a business situation, and Staples, whose own designs for industry run from bottle labeling to textile manufacturing, is not about to let his aspiring engineers forget either concern. Like their professional counterparts, the students are required to keep engineering notes, explaining all their decisions.

For instance, a shaft has to be fitted through the hole in the hub of the worm gear. The hole is a stock size (remember, the worm gear is being ordered from the catalog) *larger* than the corresponding shaft needed to transmit the necessary amount of torque. There are a couple of alternatives: the engineer can either "machine down" the shaft, leaving just a shoulder that would fit the hole; or he can "bush" the hole down to mate with a smaller shaft (a bushing is a liner that fills the space between the shaft and the hole).

"Does anybody want to venture an opinion on which way to go?" Staples prods the class. They are all silent, perhaps fearful of the horrible foul-ups in the pulverizing mills that result from wrong choices. "Look, both are viable alternatives," he

reassures them. "Come on, somebody."

A student raises his hand. "I'd use the bushing."

"Good. Why?"

"It's cheaper than machining down the shafts."

"Good. Why else?"

Genuine puzzlement this time. "Two separate parts reduce the stress concentration," Staples answers himself, after letting the class sweat for a minute or two.

Similar choices follow. How should the bushing be secured to the shaft—glue, or mechanical fitting?

"Whichever you choose, do not say 'glue,'" Staples says sternly. "'Glue' is a term that has horrified everyone. Say 'Loctite,' or 'Permabond,' and it's more acceptable."

A key-fitting allows for easier disassembly in the event of problems. But should it be a Woodruff key, a Gibb Head, or a square key?

And so on. The choices multiply. Staples brings new ones to the class's attention periodically, pacing the room and answering questions as the students labor over their designs.

"I've grown increasingly disenchanted with myself as the great lecturing ham," he says later. "These are essentially work sessions. I'm there to guide students, to interject information as they need it, instead of trying to stuff a whole mass of it into their notes and memories—where it will disappear after 24 hours."

Staples is happiest when he can teach entirely through hands-on projects, answering questions as they come up. "We all know that learning by doing is best," he said. "Unfortunately, it can't always be that way, because you still get down to a certain base of information that has to be transferred into students' brains before they can work effectively. They've got to understand the formulas they're using, or it could be very dangerous—we'd have a hell of a lot of incorrect applications of theory."

One place where he can completely avoid being "boxed in" by the need to lecture is WPI's Project Center in Washington, D.C. Twice in the past 10 years, Staples has spent a semester at the center, supervising Interactive Qualifying Projects. The IQPs give students a chance to tackle the "real-life" problems—often non-engineering in nature—of companies, federal agencies, and special-interest groups. Staples is quick to point out that many engineering students will end up doing exactly this kind of work. "If you look at the high-management positions in a lot of companies," he says, "they're often filled by people who have gone the engineering route, without even necessarily getting an MBA." The common denominator with mechanical design is the problem-solving approach, and Staples says that students doing their IQPs often realize for the first time the full value of courses like *Mechanical Design Applications*.

"Maybe they'll never do any practical board designing, but they've learned to use the engineering process," he says. "They know how to develop empirical relationships which allow them to plug data into an information base. It's a transferable skill."

Staples, who prefers working with undergraduates because "you can do more for them," was voted WPI's Outstanding Teacher in 1979 by both students and faculty.

"I prefer teaching to working in industry because teaching doesn't box you in," he says. "It's always different. Students change, they never approach things the same way as the last bunch, and they make me change strategies and assignments. I like to say that this has been an experimental course for the last 36 years."

His strongest suit as a professor is the obvious personal enjoyment he brings to the work. He thinks solving problems is fun.

"You should really like this course," the syllabus promises students in his *Design of Machine Elements* class. "Come on in and enjoy the logic and freedom of design." The "freedom" of open-ended design problems—the uncertainty and seeming imprecision which irritate and frazzle new students schooled in rigid mathematical formulas—is what turns him on.

"I think you added wrong there," a student says crossly while Staples is demonstrating stress factor calculations on the blackboard.

"So I did," replies The Boss, unfazed. He corrects the mistake.

"A lot of professors do that," whispers Walt McConaghy, '85. "Just remember, he's designed gears you'd need a PhD to understand."

ROBERT MANSBACH

His classroom is a battleground for opinions on controversial topics.

It's the kind of story most of us label a soap opera situation and then promptly forget, glad we're not the ones who have to pass judgment:

Dr. Daniel Fremont had first treated Francine for a broken jaw when she was 11 years old. He suspected child abuse, but could not prove it, and concluded that reporting it would only cause the girl more problems at home. Seven years later, Francine, pregnant as the result of a casual affair in college, visited Fremont, now a practicing obstetrician and gynecologist, and asked him for an abortion. Fremont learned she had indeed been abused and molested by her father when she was a child. He performed the abortion because she seemed mentally on a fine edge.

A number of years after that, Fremont's best friend, Tom, a devout Roman Catholic, fell in love with Francine, and she became pregnant. He convinced her to marry him and have the child, and he persuaded Fremont to take her on as a patient.

However, Francine told Fremont privately that she didn't want the child and was afraid she might harm it; she asked for another abortion, and begged him to tell Tom it was for medical reasons.

Fremont refused, the couple was married, the child was born; a year later, Francine killed it with a blow to the head. When Tom understood the full story, he made an unsuccessful attempt at suicide. He later asked Fremont, "Why didn't you tell me about Francine?"

The Hartwick College students in Professor Robert Mansbach's *Biomedical Ethics* course—most of them future nurses—couldn't just forget this story, because it was the sort of situation they might one day encounter professionally. It was also their mid-term exam.

They had to answer, not once but three times, the question of whether Fremont had acted ethically in his dealings with Francine. Had he acted ethically in the view of a Roman Catholic teleologist—that is, were his actions consistent with his vision of an ultimate goodness that is God, even if the situation had shifted to challenge his natural law principles? Had he acted ethically in the view of a Kantian deontologist—that is, did he keep inflexibly to certain principles, regardless of the final consequences? And, most important, had he acted ethically in the view of the students themselves?

"The reason for studying Kant and Roman Catholic natural law is so the students will see that there are people out there who have formulated approaches to problems like these," says Mansbach, a 54-year-old Lutheran pastor. "I'm not asking them to choose one of these approaches, just to learn how to go about building their own. If they come out of the course with the self-knowledge to do that, I'm satisfied."

Self-knowledge, Mansbach says, begins with recognizing that one may already be a deontologist or a teleologist. "I write down some of the things students say at the beginning of the course—value-laden statements like 'This is wrong' or 'I couldn't do that'—which they've never really examined before. I try to help them see that underlying these statements is usually a fairly consistent ethical approach."

Mansbach is tall and stooping, with an air of gentleness further suggested on this rainy day by gray tweeds and a forest-green turtleneck. He looks a bit like the actor McLean Stevenson, and pokes the same kind of quiet fun as Stevenson's character on *M*A*S*H*, Col. Henry Blake, who presides unflappably over the polemics of his eccentric crew.

"How about that rain, Professor Mansbach?" a passing student says in the cafeteria.

"Forty days and forty nights," the pastor replies amiably.

Mansbach needs his easygoing style. His classroom is a battleground for opinions on controversial topics, and his job is both to fan the flames and to keep the battles bloodless. In the class discussion of

the Fremont case, he divides his students into two groups, those who think that the doctor acted ethically, and those who disagree. Each group must decide upon the principles and goals underlying its position, then present them to the opposition. Discussion leaders emerge by a process of natural selection as the groups hammer out an internal consensus. Mansbach plays the role of facilitator as he walks back and forth between the two camps.

He leans over the circle of Fremont's supporters, who are having trouble finding a starting point for their set of arguments. "Why don't you consider each of his decisions as separate cases, and isolate the principles involved in each of them?" he suggests. To the students engaged in condemning Fremont: "The law requiring anyone with knowledge of child abuse to report it was not yet in effect. He wasn't legally bound to do anything."

Once the debate gets under way, however, Mansbach throws a wrench in the works at every available opportunity, even at points when the students seemingly get sidetracked onto other issues.

"What I want to know is, how can you be so concerned about his role in the baby's death if you don't consider abortion as a kind of murder?" a woman in a red sweater demands suddenly.

There is an uneasy silence, punctured by a groan from the back of the room. "Uh-oh," someone whispers.

"Come on, now," a blond woman in the pro-Fremont camp says. "we're not discussing whether the government can tell a woman what to do with her body."

Most eyes turn to Mansbach in a mute appeal for rescue from this digression.

"Gee, I don't know," he says thoughtfully. "Are you saying, then, that a fetus is a part of a woman's body? Like an arm or a leg?"

For the next 15 minutes, he lets the class debate the complexities of the abortion question. At a particularly heated moment, however, he finally holds up his hand. "It looks as if you're all saying that you'll have to decide how you feel about abortion before you tackle the issues in this case."

The back and forth of the classroom discussion is what Mansbach thrives on, and it seems to be the most important reason he is a full-time professor and only a part-time pastor. (He still shares the pastoring duties at three Oneonta churches.)

"Students really bring something to the equation," he says. "In a sermon, obviously, the structure is such that your audience doesn't respond then and there, and that's probably too bad for both you and them. There's no chance for argument and debate. Your listeners may be stirred to great thoughts when they get home, but you don't hear about it. It would be the same thing in class if all I did was speak and all they did was listen."

He's well aware, however, of the fine line between heated discussion and chaos, and sometimes the line has to be drawn. At a particularly heated moment, he finally holds up his hand, calling for a pause.

"There has to be structure," he says later. "Real freedom of thought is instilled through structure. The students have to get used to dealing calmly with views that are foreign and even repugnant to them, so they can analyze and fully understand what is being said. You don't work through disagreements in real life by taking the attitude that the other person is just plain wrong and not worth hearing out."

Mansbach, who won Hartwick's Bunn award for outstanding teaching in 1984, rarely intrudes his own views in class discussions, although he recognizes that "it's probably good if my students know what I think every now and then." He seems concerned that they will feel he's trying to sell them his own values. "I tell them in the beginning that I'm a Christian and a Lutheran, and that it will probably give weight to my teaching," he says. "I admit that I'm deontologically inclined, because I may have some underlying presuppositions which I'm not fully aware of, and I want them to be forewarned."

He saves his preaching for outside the classroom, but even there, he has a scrupulous respect for viewpoints that differ from his own. "There's been quite a resurgence of religious involvement in American political life," he observes. "I might not agree with some of the specific viewpoints of the ultra-conservative Protestants, for example—and I certainly think they have to be careful about what they try to impose on other people—but on the other hand, I don't think the framers of the Constitution ever assumed that religion should be completely separated from taking part in discussions on the wider arena of life."

In *Biomedical Ethics*, Mansbach's task is to help students face the overwhelming issues of modern medicine without becoming callous. "My hope is that, whatever their views, they don't end up as ethical egoists," he says. "Those are the people who say, 'How can I achieve the greatest possible good for Me?' Some people become that way when they can't develop perfect solutions to problems that they see happening again and again."

These days, Mansbach feels confident about combatting such disillusionment. "It's funny how things seem to go in cycles," he says. "When I came here in the fall of '68, students were very much concerned with the Vietnam War, the draft, and race relations. Then, for a period after that, it seemed as if they turned inward for a while, perhaps because they were disappointed that there hadn't been as much change as they'd expected. Now I feel as if there's a swing back the other way, particularly on questions of relations between the individual and the state, such as gender and age. It's not the burning concern of the Sixties, but it's there."

Over the years, the issues in *Biomedical Ethics* haven't lost any of their complexity. Back in the classroom, Mansbach throws another complex "soap opera situation" at a student.

"Oh, Lord!" She throws up her hands. "I don't know what I'd do."

"Well, you wouldn't move to Hawaii," Mansbach responds. "You'd deal with it."

NANCY McDOWELL

An anthropologist, she pushes students beyond their cultural biases.

Not long after Nancy McDowell began to live among the Bun, a primitive tribe on the Yuat River of Papua New Guinea, she committed the classical anthropological *faux pas*. For two days, the chief, who lived a few huts away from her, had been beating his wife, and McDowell could no longer stand the screams. So she imposed her own values on the situation.

"Basically, I ran in, stuck myself between the two of them, and called him every name I could think of in several languages, some which he could even understand," recalls the anthropologist, who wears glasses and usually exudes the kind of gentleness that puts nervous students at ease. "He didn't kill me, because they still have a fear of white people which is a holdover from colonial times. But I figured I was finished in that village, that they'd kick me out, or even worse, put on some sort of good-behavior act for me."

They did neither. The day after she had "interfered," a group of the villagers came to her and told her they were glad that, by attacking the chief, she had finally shown her true colors.

"They said they had been wondering when I was going to start acting like a white person," she says. "They'd been worried about what I would do when I saw them fight, but now they knew I was just going to call them a bunch of names. I was white, but at least I wasn't some bureaucrat who was going to run and tell the government." She laughs. "The result was that I got to see a lot more fighting, which is certainly their natural behavior, and I'll tell you, it wasn't always the men who won. If a woman was angry enough, and she could grab something first, the man often got the worst of it."

There's a lot in this story that the students in McDowell's course, *Women And Society*, could learn from. On a warm September afternoon, they are discussing *Women In The Forest*, a study of the Amazon Mundurucu women, by the husband-and-wife team of Robert and Yolande Murphy. The book describes, among other things, how promiscuous women in the tribe were punished by the men through a form of gang rape. McDowell encourages the class—thirteen women—to come at the text the way she approached the Bun chief: swinging.

"Reactions to any of this?" she asks, to open the discussion. "Did it make anyone angry?"

A girl in a red-and-white-striped polo shirt raises her hand. "It put me on the defensive immediately," she says. "It seemed as if the women were just there to serve the men without getting anything in return. I think they'd be better off without the men at all."

To an observer at this point, there seems every chance that the class could turn into group therapy, with everyone agreeing with one another. But McDowell, winner of Franklin and Marshall's Lindback

Award for teaching, has no intention of leading everyone to the same conclusions.

"I don't mind it this early in the semester if they articulate a lot of personal feelings and experiences," she says later. "And in this kind of situation, I throw out a lot of things that I know will appeal to strong feminist sentiments, because it gets people talking. I also direct things toward certain viewpoints in the class—if this one has a background in women's studies, or that one is a Marxist."

The result is an atmosphere in which seemingly anything goes, but McDowell also has an agenda toward which she steers the discussion.

"I have certain points which I want to cover," she says. "Believe me, it's much more exhausting to follow a class discussion than it is to lecture. I have to keep tabs on what's been said. Usually, the important stuff gets brought up naturally, but afterward, I always check my notes to see what we missed, and I make sure we cover it next time."

Or as JoAnne Comerford, '85, puts it, "Even if somebody says something which doesn't seem to totally pertain to the discussion, she'll usually manage to tie it in."

In the class on *Women In The Forest*, the first student's feelings trigger a variety of reactions which, tempered by McDowell's occasional interjections, do, ultimately, lead to focused discussion. The idea that the Mundurucu women could do without the Mundurucu men proves particularly fruitful.

"I know the Mundurucu women were officially decreed inferior in the society, but I had the impression that they didn't accept that at all," a red-haired woman says. "They seemed so separate that they didn't even feel dominated."

Another student is reminded of her own experience of living for six months with a Turkish family. "I envied the women there," she says. "We all had to do the housework while the men went away during the day, but it was fun, because we were together. You didn't think about wanting to do what the men did, because you had your own thing. Of course, you were supposed to lower your eyes when the men passed by, and I wouldn't do it, but the other women had the attitude of, 'Well, he doesn't do much for me, I'd just as soon look at the ground.'"

When the laughter dies down, McDowell draws the academic connection.

"You know, the American world view in anthropology always assumes hierarchy in the cultures it studies," she says. "We imagine that one group is always occupying a position superior to the next, and we can never accept the idea of separate but equal."

She isn't just poking at American anthropologists with this observation; it's directed at the class as well.

"We have to at least be aware that we may be projecting a lot of our own values here," she says. "Remember that the Mundurucu women are appalled when the anthropologists tell them that in America, water comes to the house through a pipe. Where do the women meet every day, then, if not to gather the water? And there's no farina shed? What a terrible place!"

She does zero in on the book's authors, though, suggesting that the husband-wife collaboration may have ended up reflecting more of the husband's biases, even though it was ostensibly the wife's project.

"Robert Murphy was a well-known scholar who had already published several books, while Yolande was a graduate student working on her dissertation," McDowell says. "You have to wonder why the first philosophically oriented chapter to occur in the book is about the tribe's male ideology. One reason could be the presence of her husband. The other is the reality of anthropology graduate projects: when you study a tribe, you'd better come home with the male ideology, and not a consideration of basket-weaving or any such women's stuff."

At these times, McDowell seems to be wearing her opinions on her sleeve, but she's just playing devil's advocate—again, because it loosens tongues.

"Students have a tendency to think that just because something's in print, it must reflect the truth," she says. "I'm just pushing them to be critical. I guarantee that by the middle of the semester, each of them will have been in my office trying to figure out what it is I really think. Hopefully, they still won't know in January."

McDowell herself had to figure out what she really thinks in a climate of strong opposition. As a graduate student, she was yelled at by no less an authority than the legendary Margaret Mead, herself a veteran of the Yuat River region. The pioneer anthropologist told McDowell that before going to leave with the Bun she should completely rethink her project. McDowell ignored the advice, and later, when she needed a break after 14 straight months with the villagers, a somewhat softened Mead gave her the money for a leave.

McDowell's work on the Bun consists of fascinating, almost psychoanalytic deductions about their collective behavior: she argues that the tribe is obsessed with independence, and that they are suffering inadequacy feelings as a result of being unable to repay debts to the regional government.

"Anthropology isn't a science," she says, "and I think it would be a terrible thing if it were turned into one, because the scientific method, with all its statistics and correlations, would kill our best insights. At the same time, we have to be willing to test and refine our ideas."

In a sense, the students in *Women In Society* confront the equivalent of McDowell's wife-beating chief and learn some of the same lessons. They charge at something they see, reacting to their emotions, and after the initial confrontation, come away with what should be a tempered outlook. McDowell thinks both parts of the experience are important.

"We're dealing with sophisticated issues and readings in this class," she says. "Feelings are a good starting point, but ultimately the students have to be able to do more than just talk about things their grandmothers have said."

By Ivars Peterson

How can engineers and architects be certain that a building's structure and materials are earthquake-proof?

No-Fault Earthquakes

Experience can be an expensive teacher; scale models are cumbersome and not always precise. The answer: computer modeling.

The ground shivers, sending tremors through a skyscraper's steel and concrete framework. The structure shudders. Its columns, beams, and braces stretch and strain. Seconds later, the vibrations die out, and the earthquake is over. Often, the building is still standing; sometimes, it has collapsed.

This scenario seems out of place in a small city like Worcester, Mass. There are few tall buildings; earthquakes rarely strike. Yet, such events occur regularly in an engineering laboratory at Worcester Polytechnic Institute (WPI). There, a computer plays the roles of both earthquake and building, and researchers pore over pages of computer-generated data that represent the way a structure reacts to an earthquake.

In civil engineering, says WPI's P. Jayachandran, you generally can't test a full-scale building to ensure that it can survive all but the most severe earthquakes or storms. Adds William E. Saul of the University of Idaho, "Obviously, you can't build a structure that's 40 stories high and then subject it to vibrations until you knock it down. You have to do it with a computer model. You destroy the computer model within the computer to see what the building can take."

Another reason that computer modeling makes sense, says Jayachandran, is that "you cannot generate earthquakes in the lab very easily." Even a "shaking table," on which scale models of buildings can be mounted and then jolted, has limitations. (At the common 1:4 scale, a 40-story model would still be 10 stories high, and models cannot reproduce all the properties of real buildings.) "That's why the computer analysis is so useful," he says. "You can try a lot of different things in a matter of days." Without computer simulations, structural engineers would have little information about whether their designs would work under earthquake conditions.

Jayachandran and Saul are among the growing number of researchers working in the fields of earthquake and wind engineering. A few decades ago, both specialties were minor parts of civil engineering. But the development of new materials, which allows the construction of ever-taller structures, and great increases in computer speed and power have changed the situation. Now, frequent international conferences bring together researchers from all parts of the United States and countries like Australia, China, the Soviet Union, Japan, and India to discuss the latest developments in these fields.

"We are looking for improved methods of calculation—improved methods for

Wide World Photos

A computer models both building and quake, then collects detailed data: to simulate a 10-second earthquake takes 30 minutes.

modeling tall buildings," says Jayachandran. At the same time, there is a great need for experimental data, based on real earthquakes and real buildings, to check the validity of computer calculations.

Computer programs now being used to simulate earthquake effects are remarkably sophisticated, says Jayachandran, and generally take months to learn how to use. The initial step involves creating a computer model of the building. "The computer programs are very general," he says. "You can model many different materials—timber, concrete and steel, aluminum, and copper."

First, the structure is broken down into a set of small pieces, which often individually correspond to a building's columns, girders, and braces. Each of these "finite elements" has its own mathematical expression that describes both its relationship to other pieces and the way in which forces, such as those generated in an earthquake, act on it. "We create a skeleton of the building—what's called a 'finite-element mesh,'" says Jayachandran. Once the mathematical skeleton is in place, the building can be subjected to an earthquake.

That earthquake can be "synthetic" or "real." In the latter case, the computer uses ground motion data recorded during an actual earthquake. The most widely used data come from the 1941 El Centro, Calif., tremor. For many years it was one of the few recorded earthquakes providing enough information for engineering applications, and it pops up as a kind of standard in innumerable engineering studies.

"Sometimes we make a mathematical model of the earthquake itself," says Jayachandran. During an earthquake, different amounts of energy go into the various frequencies of vibration that make up the ground motion. Using this information derived from seismic data, the computer mathematically generates a series of random pulses that combine to produce the synthetic earthquake.

Ivars Peterson writes on policy and technology for Science News.

For a typical, 10-story building, the WPI computer (a DECSYSTEM-2060 that serves the entire university) takes about 30 minutes to decide the building's fate. In that time, it calculates the strength of the forces acting on each piece of the structure and how much each piece is displaced, repeating the operation about 1,000 times during the course of the simulated earthquake.

For the building as a whole—as well as for any floor, or any particular girder, column, or brace—the program provides a record of how the structure responds every one-hundredth of a second during an earthquake that may last 10 seconds. Says Jayachandran: "You really get a pile of output."

Another set of computer programs translates this mass of data into graphs, to highlight the key features of a building's response to an earthquake. Recently, Jayachandran has been thinking about displaying the data on computer screens and photographing them in sequence to produce motion pictures of a building's vibrations. "The technology is available," he says. "We just don't have the facilities now at WPI to do it."

On a more elementary level, architecture students at Rensselaer Polytechnic Institute (RPI) can already watch the exaggerated sway of a building wobbling under an earthquake's influence. Two years ago, Richard W. Quadrel of RPI's architecture department developed an interactive computer graphics program that allows undergraduates to investigate how the shape and structure of a building affect its stability and motion during an earthquake.

"In a simplified study of earthquakes, what we're primarily concerned with is the horizontal shaking of the ground in one particular direction," says Quadrel. "The program takes the major factors and allows you to play with them a little bit to see what the results are on the building." As might be expected, he says, short, squat buildings, even with very little bracing against earthquakes, are more likely to survive, because they are less flexible and don't bend as much as tall, slender buildings.

Meanwhile, Jayachandran is looking for ways of running his much more complicated simulations on smaller computers, so that small building and design firms can study, in greater detail, how their building designs respond to earthquakes, as required by an increasing number of building codes. "Architectural and consulting firms," he says, "usually can't afford to buy a computer like a DEC-620."

Measurements on real buildings during earthquakes and data from laboratory experiments also provide valuable information. "Until recent years, it was difficult to get any kind of accurate earthquake measurements on real buildings," says Idaho's Saul. Now, dozens of tall buildings in California, for example, have special instruments that record the building's motion during an earthquake. (In some areas, buildings greater than a certain height must now have at least three engineering seismometers.)

"From that you get an idea of how real buildings behave," says Jayachandran. "But I think we need more instrumentation

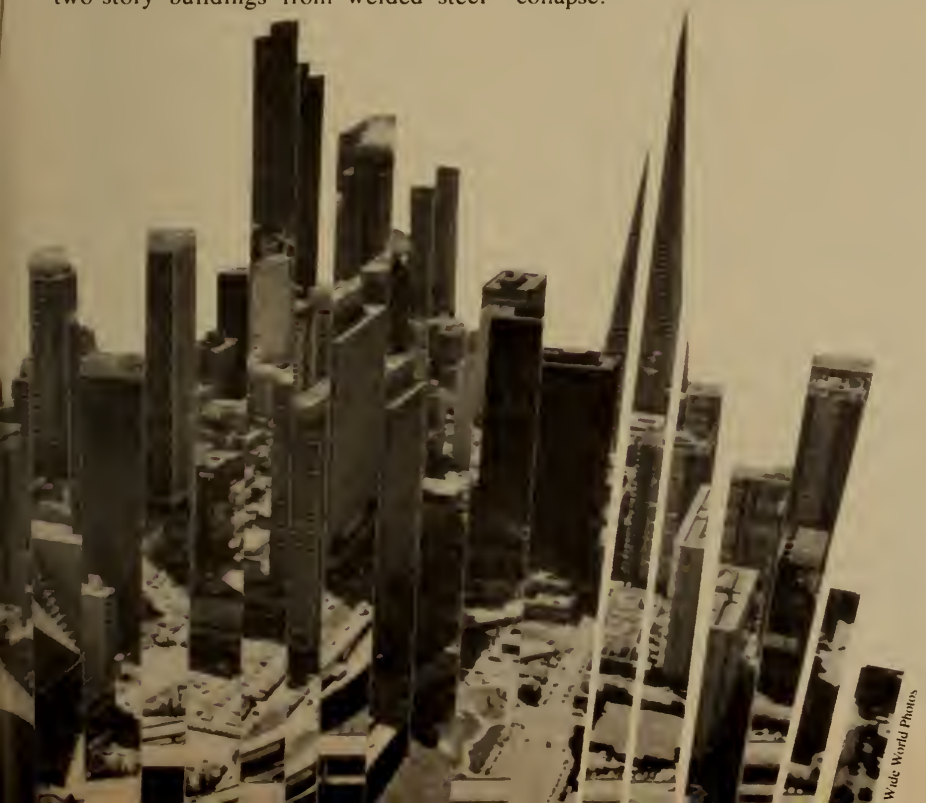
on the East Coast and in the Midwest to see how the earthquakes in those locations affect buildings." One of the difficulties in earthquake engineering is that earthquakes are infrequent and highly individual.

Some of the most elaborate laboratory work is going on at the University of California at Berkeley in the Earthquake Engineering Research Center. There, a 50-ton shaking table, 20 feet long and 20 feet wide and carrying structures up to 30 feet tall and as heavy as 50 tons, recreates the ground motions of actual earthquakes that have hit California and Japan. Working from mathematical models, researchers at the University of Michigan, Ann Arbor, use a cyclic loading mechanism to simulate earthquake effects. A hydraulic device creates the loads and applies them to scaled-down structures. "Some of these results will help us verify our mathematical models," says Jayachandran, who plans a smaller version of the Michigan device for his WPI lab.

Jayachandran and his students have also done some laboratory work. Last year, they built scaled-down models of one- and two-story buildings from welded steel columns and beams. They didn't use a shaking table, but simply applied forces to the models to test the effectiveness of braces.

Out of all this, researchers have already learned a great deal about how tall buildings, in particular, respond to earthquakes. A building that survives an earthquake tends to be tied together so that it works as a unit. At the same time, the building cannot be too stiff, nor too flexible. A stiff building is very expensive to build, and it usually cannot absorb very much energy. A flexible building, on the other hand, may sway too much during a storm or a quake. It could survive an earthquake, but its interior would be left in a shambles.

"You have to balance all these things when you design a building," Jayachandran says. "It's an optimization problem in *n* dimensions." The answer, he says, is to build structures with joints that can absorb energy. "It's essentially the energy-absorbing capacity of buildings that allows them to take large earthquakes and not collapse."



Wide World Photos

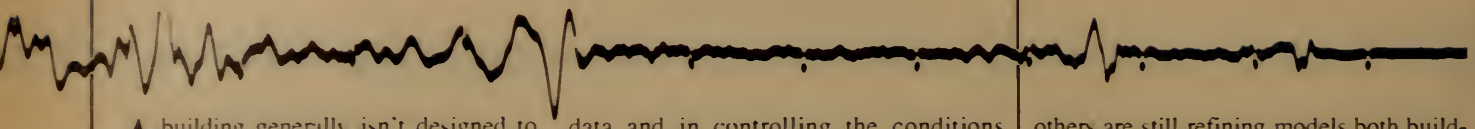
A building should be stable enough to allow people to get out with sufficient warning. The acceleration should be limited so that people do not feel ill during windstorms. The building deflection—how far it sways from its normal position—should be less than levels at which walls and windows crack. The joints between beams and columns must have enough energy-absorbing capacity to withstand large vibrations. In addition, Jayachandran notes the skyscraper design must be aesthetically pleasing, inexpensive, and feasible to build.

"When a building is designed and built, the engineer is responsible for the building behaving properly in windstorms or in earthquakes," says Jayachandran. "You have to follow all the different building codes, and you have to optimize the cost, too." Sometimes conflicting requirements must be resolved. Raising a building on columns, for example, saves it from floods, increases the amount of heat exchange—and produces a "soft story," a weakness when there's an earthquake. However, the same unity and continuity of structure that allow a well-designed building to perform well in a hurricane will also allow it to resist earthquakes.

With such complicated sets of requirements, computers become invaluable tools for earthquake and wind engineers. Building codes themselves have changed considerably in the past decade, as new materials like tough steel alloys and stronger concrete have been developed, and as computer simulations have provided the information needed for revision. Thus, design is a much more complex process now than in earlier decades, says Saul, but the final results are more predictable.

Meanwhile, new techniques for analyzing the way structures respond to "loads," like earthquake forces, continue to be introduced. The earliest type of modeling for earthquake effects dealt with extremes: researchers estimated the largest loads that were likely to act on a building, applied those forces, and measured the final result. But the approach that Jayachandran and

A Model Built on Sand



A building generally isn't designed to float. But within minutes, the shaking of an earthquake can turn a firm, sandy soil saturated with water into a liquid-like mixture that no longer supports a building. "There are some very impressive photographs of five- or six-story buildings in Japan that were vertical before an earthquake and horizontal after," says civil engineer Ricardo Dobry of Rensselaer Polytechnic Institute. "These buildings were asked to work as boats for a few minutes, and they couldn't."

Dobry, one of six civil engineers at RPI doing research in earthquake engineering, specializes in the field's "geotechnical" aspects: in particular, the liquefaction of saturated sand and the failure of earth dams, dikes, and embankments during earthquakes. "The phenomenon of soil liquefaction sounds very esoteric," he says, "but it happens over and over again. Most big earthquakes cause a lot of liquefaction."

The problem is that when an earthquake shakes wet sand, the grains of sand roll and slide to get into more stable positions. The sand settles, increasing the water pressure inside the mixture because excess water can't escape quickly enough from among the sand particles. At a critical pressure, the sand grains physically separate, and the mixture of sand and water begins to behave like a liquid.

"Dams that consist of piles of loose sand are very sensitive to earthquakes. They liquefy, they flow, and they fail easily," says Dobry. Although loose sand no longer goes into the construction of earth dams, a number of older dams of this type are still in use. In contrast, dams constructed from clay soils don't fail catastrophically, even when they are poorly built, because clay particles cling together better than sand particles.

Most of Dobry's work takes place in a sophisticated laboratory at RPI where he subjects cylindrical samples of soil to vibrations, studying the liquefaction behavior of the specimens. Computers play an important role both in collecting data and in controlling the conditions under which experiments are done. With the recent installation of new computer equipment, Dobry says, the researchers expect to be able to produce signals that shake the soil samples just as they would be shaken during a real earthquake.

Dobry is also working with the U.S. Geological Survey and a researcher at the University of Texas in Austin to develop a computer model that predicts how soils behave under various conditions. Right now, the team is measuring the properties of soil layers taken from places like the Imperial Valley in Southern California, which was shaken by a 1979 earthquake. These soil characteristics become part of a computer model, and the computer calculates the effects of seismic waves as they propagate through the soil.

"The model tells you if liquefaction is occurring at a particular layer," says Dobry. "Then, you go and check for evidence of liquefaction at those sites. In the future, if we happen to have an earthquake at an instrumented site, we will be able to verify our predictions."

In the case of earth dams, says Dobry, "we are trying to see if our techniques could have predicted the near-failure of the San Fernando dam in 1971." During an earthquake, one of the dam's slopes liquefied and flowed, threatening more than 100,000 people in the Los Angeles area. "It was almost catastrophic," he says. "The earthquake ended just as the dam was starting to go. Most of us estimate that after 5 or 10 seconds more of shaking, it would have gone."

Computer models will become increasingly important, says Dobry. Currently, liquefaction field studies are time-consuming and expensive and, therefore, can't be done for every project and every site. A reliable computer model would need data from only a few, simple, cheap field measurements to come up with a good picture of how soil at a particular location would behave during an earthquake. However, says Dobry, that kind of modeling is still far away.

—Ivars Peterson

others are still refining models both building and earthquake, then puts them through the computer to calculate everything that happens, in split-second intervals, for the earthquake's duration.

A new technique that shortens the time it takes to run a simulation on a computer is coming, says Saul. Instead of looking at accelerations and deflections, the researcher looks at vibrational frequencies.

In one sense, a building is somewhat like an inverted pendulum, and a bridge is a little like a guitar string. The signal—in this case, an earthquake's vibrations—enters the structure and interacts with it. Out of this interaction comes a modified signal. In other words, the structure is considered to act like a filter. Just as audio engineers can learn about electronic components within an amplifier by comparing sound waves fed into an amplifier to those coming out, structural engineers may someday be able to apply a similar method of frequency analysis to buildings.

This technique, adapted from methods used in electrical engineering, is faster than the full computer simulations now run, says Saul. Some of the more advanced engineering firms already use it in a simplified mathematical form. However, when it comes to more sophisticated uses, working with more complicated structures, it's very much an area of research. The displacement of well-established methods by something in which the mathematics is different, says Saul, is not easily accepted by building officials and others. "Until we learn more about the method, it will not be generally accepted."

"We are constantly improving our computer programs," says Jayachandran, to provide better information for engineers who must ensure that their buildings survive the hazards of wind and earthquake. "Although there are few tall buildings in small cities like Worcester, computers allow me to study and do things that are of general use to the whole country," he says. "All I need are a computer and books. I can study buildings anywhere in the world."

"...of the waters of the Earth"

A look back at the pioneering career of hydrologist Ray K. Linsley, Jr., '37

Back in 1937, when Ray Linsley graduated from WPI with a B.S. in civil engineering, the field of hydrology was in its infancy. Save for a volume written in 1919, in the mid-'30s there weren't even any textbooks on the subject. He would soon help change all that with publication of four highly regarded texts. He would influence the field in other dramatic ways as well. But first, for the uninitiated, a primer on the sometimes arcane world of hydrology.

Hydrologists, Linsley explains, plan, design and operate engineering projects for the control and use of water. "They deal with questions like: What flood flows can be expected over a spillway, at a highway culvert, in an urban storm drainage system? What reservoir capacity is required to assure adequate water for irrigation or municipal water supply during drought? What are reasonable boundaries for a floodplain?" Obviously, geography, geology, and meteorology play leading roles in this global drama. And as much as in any other field of engineering, he says, hydrologists must deal with the interconnections between the laws of nature and the needs of people. "Judgment," he adds, "is crucial."

The earliest evidence of hydraulic projects (hydrology is a specialized field of hydraulics—the science of fluid flow) dates to about 3000 B.C., when a diversion dam is said to have been built by King Menes to redirect the Nile so that Memphis, his capital, could be constructed on a fertile riverbed.

Yet it wasn't until about 1930, says Linsley, that a quantitative approach beyond simple measures of rainfall and streamflow was undertaken. "It was as if

they used a shotgun to plot data on graph paper," he says, "and then drew a line through the mess." Birth in the '30s of the Tennessee Valley Authority (TVA)—giving the Army Corps of Engineers the job of controlling floods and creating the Soil Conservation Service to reduce soil erosion—changed the entire scope of hydrology. "Today, of course," he adds, "the computer has taken over, and we can work more from historical climatic and geological records to model the foreseeable future of a given region."

Recently, for example, his firm, Linsley, Kraeger Associates Ltd., a three-person Santa Cruz, CA, consulting group, was called in to redesign the spillway for a dam near Santa Cruz, using a hydraulic model to come up with a simple way of increasing capacity without requiring major reconstruction. He has also recently conducted large projects for the Dominican Republic, developing a hydrologic basis for design of a hydroelectric plant; and for the Jubail (India) Industrial Park, working on the storm drainage system of a desert site that, when it does receive rain, suffers torrential downpours. And as an expert witness, he has testified in a Supreme Court case in which the State of Wisconsin claimed that Illinois was not adhering to a ruling of their right to divert waters from Lake Michigan.

Linsley's first job out of WPI was a three-month engineering stint with a New York City firm. Repulsed by the congestion of the city, however, he took a post in Knoxville with the TVA, forecasting river flow. This early taste of hydrology, and his entrance into this emerging field at its beginning, poised him on the springboard of greater things to come.

In 1940 he joined the U.S. Weather Bureau as a hydrologist, working first in Washington, DC, and then in Sacramento, CA. "I thought about law school then," he says, but with the war and later a family of four children to raise and educate—well, advanced degrees simply took a back seat to the demands of everyday life. But, this never seemed to impede his career.

During the war, he taught Air Force air weather officers flood forecasting. "I enjoyed teaching," he recalls, "but I saw right away the need for better hydrologic instruction at the college level." This resulted in *Applied Hydrology* (with Max Kohler and Joseph Paulhus, McGraw Hill, 1949), still the standard work in its field.

The end of the war saw Linsley promoted to Chief Hydrologist at the Weather Bureau. Then, in 1950, Stanford University offered him a faculty position, which led to his becoming chairman of Stanford's civil engineering department and later associate dean of the College of Engineering. At Stanford he built the nation's first graduate hydrology program. Two of his students would later go on to head graduate programs of their own at Utah State and the University of Washington.

Linsley taught a course at Stanford on the economic and societal impacts of hydrology. Student response, he says, was

continued on inside back cover

The Fastest Hand in the East

Dr. David Cyganski, '75 BSEE, assistant professor of electrical engineering and this year's recipient of WPI's Outstanding Teacher Award, doesn't have a middle name. But, if he did, it could well be "Enthusiasm." Just watch him at the chalkboard sometime.

By Ruth Trask

When it comes to discussing students and education, two of David Cyganski's favorite themes, he jumps right in with both feet. "The educational process shouldn't be an exclusive competition for just a winning few," he asserts. "It should be easily accessible to everyone."

Cyganski minces no words when he discusses what he feels is wrong with education in general today. "Too many teachers and too many textbooks make learning difficult," he says. "A student may have an aptitude for a subject such as science, but no real interest. It is the teacher's job to develop that interest by simplifying the subject matter and making it more meaningful."

According to Cyganski, most textbooks concentrate too much on "pure" theory, with the subject's practical application surfacing only at the end. "I like to turn things upside down," he reports. "I tell my classes *why* they need to know something before they ever open a book."

In a nutshell, Cyganski's basic philosophy of teaching is, "If it's worth knowing, it can be put simply. And no matter how abstract a subject may be, it should, somehow, be connected with everyday life."

His students appreciate his fresh approach to teaching. Says John O'Donnell, '85, of Fitchburg, MA, "Prof. Cyganski makes me feel comfortable during class. He knows how to get across the most significant aspects of the material without getting overly technical. Also, he has a good sense of humor, is easy to listen to and generally gives off good vibes!"

While still a student in high school, Cyganski tutored his classmates. "I was no athlete," he explains. "Helping out my fellow students with their studies was a good way for me to make friends." Being involved with education at such an early age on a one-on-one basis, he decided long ago that nothing is easy until it is explained and understood, and that slow learners should be given an opportunity to develop their own potential at their own rate.

Always a top student himself, Cyganski nonetheless has had to relearn things that he feels are not adequately taught in high school and grammar school. "Sometimes it's almost impossible to recover from the mental crippling received at the hands of a bad teacher," he says. "That is why some students have such difficulty at WPI." They may do well on their aptitude tests, which he says measure mere "history," but they may not be able to achieve at the college level because they lack a basic understanding of the subject at hand.

William Denson

Cyganski, who says he's spent his whole life "learning how to learn," has spent a lot of time learning at WPI. He received his BSEE with high honors from WPI in 1975, his MSEE in 1977 and his PhD in 1981.

"The Plan is what drew me to WPI originally," he reports, "plus my interest in electronics. There was plenty of latitude in the Plan, so I could choose a wide variety of courses. I could also pursue some interests outside of engineering, which I enjoy as well."

After graduating with his BSEE, he says, "I decided to stay at WPI to work for my master's simply because I liked the school. It was a natural thing for me to do."

Why he continued on for his PhD is a different story. "While I was with Bell Labs in North Andover in 1978, I was asked to teach some evening graduate courses at WPI," Cyganski says. "At the time, my wife, Janet, was studying at Worcester State. It made sense for me to leave Bell Labs, teach here, and work for my PhD."

He laughs, adding, "People give me strange looks when they discover I've gotten all my degrees at WPI. I'm not sure, myself, if I'd do it again. But, I feel that I got a very good education here. In the end, it doesn't really matter where you get your PhD. That kind of knowledge comes mainly from libraries and original papers."

Cyganski's professional and research interests at WPI are varied. Recently, under a National Science Foundation grant, he and Professors Kevin Clements, the late Donald Eteson, '48, Dan Wolaver and Gary Krumpholz, '78, developed a system to help integrate the use of the computer into engineering education. Last summer, a research contract for collecting and analyzing data on harmonics in power systems, which he will co-investigate with Professors John Orr and Alexander Emanuel of the EE Department, was accepted by Eastern Utilities Associates.

Emanuel, himself a former WPI Teacher of The Year, says that Cyganski is not only an excellent teacher, but an outstanding researcher. "Two years ago," he says, "Dave took over research [sponsored by New England Electric Systems] which I originated, focusing on determination of current wave-shape and intensity in overhead power lines, based on magnetic field measurements." The problem to be solved was extremely difficult and required a clear understanding of field theory as well as the use of tomographic reconstruction techniques. The development of unusually involved software was only a part of the chore, which demanded experience, discipline and faith in oneself, says Emanuel. "Thanks to Dave's knowledge, perseverance and talent," he adds, "this project is now well under way."

Another colleague and co-researcher, John Orr, says that Dave's pleasure is obviously in accomplishing the research work itself, rather than in showing off his own ability. Regardless of the origin of an idea, his references are always to "our" work, Orr explains. "Also," he says, "Dave has the 'fastest hand in the East' when it comes to writing on a chalk board." According to Orr, he can produce pictures, equations and explanations at an incredible rate.

In 1982, in recognition of his accomplishments in research, Cyganski was named the first Joseph Samuel Satin Distinguished Fellow at WPI. "The fellowship enabled me to do further research in the area of robot vision," he says, "an opportunity for which I am most grateful."

Currently, he is deeply involved in the field of robot vision. "Robots have to be smart," he says. "They not only have to be able to 'see' objects, they must be able to identify them. They must be made more sophisticated."

To this end, Cyganski has done extensive research and has written many papers on the subject. "We are on the threshold of a breakthrough in robotics at WPI," he asserts.

When not teaching, advising or doing research, Cyganski serves on faculty, administrative and departmental committees at WPI. He currently serves on the Computer Advisory Committee and is chairman of the Committee on Academic Policy.

At home, his interests turn toward ham radio. "I've loved ham radio since grammar school," he confesses. "I have talked with people all around the world. It's a wonderful hobby."

When he was in high school, he made his own receivers, antennas and other circuits. "Now, I'm more or less a weekend operator trying to keep up my skills."

Recently, while aboard the *Queen Mary*, which is currently a ship-hotel docked at Long Beach, CA, his hobby served as an unexpected "open sesame" to off-limits portions of the ship. "When the radio room crewman, a ham radio operator himself, learned that I, too, was an operator, he invited me right into the radio room and let me use the equipment," he reports. "It was great!"

Other pastimes are running home computers, reading science fiction and collecting comic books. And, speaking of running, he jogs every day.

Still, teaching—and student advising—are always right up there heading the list of Cyganski's interests. He counsels graduate students with their theses and undergraduates with their MQPs and IQPs. He seems to truly enjoy helping others. Most of all, he likes taking the mystery out of learning.

William Grogan, '46, dean of undergraduate studies at WPI, sums up Cyganski in a single, succinct sentence: "Dave is a dynamic, natural-born teacher and a brilliant researcher, but above all, he has a deep personal concern for his college, his colleagues and especially, his students."

This year, if a teaching Olympics had been held at WPI, David Cyganski would have walked off with the gold.

WPI CLASS NOTES

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Senior Vice President
Paul W. Bayliss, '60
Vice President
Richard B. Kennedy, '65
Secretary-Treasurer
Stephen J. Hebert, '66
Past President, Peter H. Horstmann, '55

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Walter J. Bank, '46
William J. Firla, Jr., '60
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C. John Lindegren, Jr., '39
David B. Denniston, '58
Francis W. Madigan, Jr., '53
George P. Strom, '56

1920

Reunion **May 30–June 2, 1985**

1925

Reunion **May 30–June 2, 1985**

1930

Reunion **May 30–June 2, 1985**

1933

Norm Clark reports that he recently attended a very special reunion, the 100th anniversary of Dudley YMCA Boys' Camp at Westport, NY, the oldest organized boys' camp in the U.S.

Raymond Crawford of Oakham, MA, writes, "In my fifth year as a selectman. Am now chairman of the board." He also has a two-acre garden, and writes a garden column for *The Hamburg* (NY) *Sun*. In 1969, he retired as a group leader and senior scientist in the research department at Allied Chemical. He has taught general chemistry at West Seneca (NY) High School and taught as a substitute in North Brookfield, Quabbin and Wachusett high schools in Massachusetts. Currently, he serves as Oakham correspondent for *The Barre Gazette* and as president of the Oakham Historical Association. "No time to grow old," he says. He has one daughter, three granddaughters and one great-grandchild.

After working 50 years as an actuary in various companies in the East and Midwest, **Frank Dodge** retired with his wife in 1983 to Venice, FL. He says they are at last finding time to do some of the many things that couldn't be done in a working lifetime.

No wonder Ev and **John Henrickson** did so well in the golf tournament at our 50th reunion. We hear they are playing four to five times a week on different courses as members of a "Grasshopper" group, and that their handicaps are 17 and 11 respectively. They, along with 54 other couples who are residents of Sun City Center in Florida, are members of a dinner dance club that meets monthly. These activities, combined with sessions with grandchildren and a yearly visit to John's home town of Holden, "make for a top-notch life of retirement."

Harry Jensen is living proof of the fact that no matter how busy a person may be during his professional career, he probably will be just as busy in retirement. Since he left Sikorsky Aircraft as vice president of engineering in 1978, Harry has found his time fully occupied with fishing, along with maintenance of his boat and his homes in Connecticut and Florida. He also does a little consulting when it doesn't interfere with the fishing. He and his wife, Kay, have eleven grandchildren. He is hoping to steer the oldest grandson to WPI next year.

Wes Reed finds, as do so many of us in retirement, that he just doesn't seem to have enough time to spend doing the things he anticipated, such as traveling, or pursuing his hobby, which is collecting antique musical instruments. Instead, he's busy on committees and boards, as well as maintaining his 20-room house and its grounds, which he describes as "four acres of recalcitrant grass, trees and brambles."

We are sorry to hear that **Art Smith** is seriously ill. He is now at Crestfield Convalescent Home in Manchester, CT.

Al Brownlee, Class Secretary

1935

Reunion **May 30–June 2, 1985**

1937

Harold Cox writes that his daughter, Alice Mignerey, is now a full professor of nuclear chemistry at the University of Maryland.

Roland Farrar, Sr. serves as president of Inspection Service, Palm Harbor, FL.

1939

Richard Muller has retired. He had been with Tucker Associates, East Longmeadow, MA.

Leo Rourke is retired from Tenneco-Newport News (VA) Shipbuilding.

1940

Reunion **May 30–June 2, 1985**

Robert Gibbs is a staff engineer in electronics at Bridgewater (MA) State College.

Edward Goodrich, formerly employed by the state of Ohio, has retired. He writes that he and his wife, Larue, spend five months of the year in St. Petersburg, FL.

1943

Arthur Medine, Jr. has retired. He had been superintendent of engineering in the grinding wheel division at Norton Co., Worcester.

Richard Whitcomb, research associate at the National Aeronautics and Space Administration Langley Research Center, recently delivered the fifth H.S. Stillwell Memorial Lecture at the University of Illinois at Urbana-Champaign. His topic was "NASA Research on Laminar Boundary Layer Control."

1944

Following a successful career in industrial consulting, especially with Hustler Inc. ("No. 1 CB antenna supplier when the boom was on."), **Ralph Allen** is now located in Ft. Lauderdale, FL, where he "restricts" himself to local assignments and gets home every night. Early in his career, he was with ITT, Sanders Associates, Schlumberger Ltd. and RAE Corporation.

Gordon Anderson serves as senior staff engineer with ISO Commercial Risk Services Inc., Parsippany, NJ. He is still primarily

involved with evaluation and public fire protection.

Lou Baldini writes that he is licensed in 33 states doing work for two national clients listed on the New York Stock Exchange. He is vice president and chief electrical engineer with IC Thomasson Associates in Nashville, TN. Once a year he goes to Mexico or Alaska on a fishing trip.

Ned Bigelow, manager of the electronic structures unit for GE in Schenectady, NY, says that he commutes to the R&D center by canoe. In his leisure time, he sails Windsurfers and a Shark "whenever possible." He holds 38 patents and has published about 50 articles.

Norman Blodgett reports that the hottest item his Worcester law firm (patent, trademark, copyright law) is handling at the moment "seems to be computer programs." The Blodgetts bought the Oak Hill Inn at Cape Cod in 1960. "My old 1910 Crosby catboat is anchored out front," he writes.

After 25 years in Washington, DC, with the Navy Department, **Philip Brown** retired in 1978 to Amherst, MA. While in Washington, he served as chief geotechnical engineer for the department and was concerned with construction and maintenance of naval stations, port facilities, etc. in the Pacific, Europe and Southeast Asia during the Vietnam buildup. In retirement, he is doing some consulting and is trying to learn to play golf.

Newton Burr, management consultant for Profit Management Development Inc., Barrington, IL, writes that he has consulted in milk, ice cream and cheese plants all over the U.S. and Canada. Clients have included Hood, Borden, Meadow Gold and Land o'Lakes. Previously, he ran his family's milk plant for 18 years. When the plant merged with Brock Hall Dairy, he worked for that company for five years.

Don Buser, former manager of design engineering at Allied Corp., retired last year. Earlier, he had been with Ford, Bacon and Davis, Chemical Construction Corporation and Standard Oil of New Jersey. In 1955, he contracted polio, which left his mobility severely limited. "Thanks to the automobile I've led a reasonably normal life." He has a master's degree from Polytechnic Institute of Brooklyn.

Sherman Campbell continues as manager of R&D at Champion Products Inc., Perry, NY. He is concerned with innovations on screen printing of textiles. Besides being active with his local church, he serves as treasurer of the Chamber of Commerce. He enjoys National Ski Patrol activities and golf.

Last year, **Richard Carson** retired as chief project engineer for Texaco Inc., Houston. His responsibilities included management of design and construction of a co-generation system, which was completed just before his retirement. He had been with Texaco for 37 years. Over the years, he has been involved with Boy Scout work, sailing and trailering.

John Chandler is not only vice president of York International (Borg-Warner), but he also is the registered federal lobbyist for the company. He says he finds lobbying "extremely interesting." Throughout his career in Washington, DC, he has been active with the Shipbuilders Council of America, the Navy League, the Society of Naval Architects and Marine Engineers and the American Society of Naval Engineers, among others. He is chairman of the orthopedic committee of the Kiwanis Club and president of the University Club of Washington, DC.

Charles Cooper, engineering manager of Lawson-Hemphill, Central Falls, RI, has been granted three patents. Earlier he had been with Scott Testers and Augat Inc. For several years, he ran the family business. He served in the Navy during the Korean conflict, the Berlin crisis and the Cuban missile crisis. He is a retired captain in the U.S. Naval Reserve.

Last year **Stewart Dalzell** retired as a quality engineer from Stanley Tools, New Britain, CT. Prior to retirement, he had been involved with church and YMCA work in the Kensington area. The Dalzells now reside in Humarock, MA, where they recently "rebuilt our summer home on the water."

Vladimir Dimitroff is senior control engineer for GE's medium steam turbine department in Lynn, MA. He joined GE in 1947. Currently, he is moderator of his local church and belongs to an organ club, which he has served as president.

Peter Dooley, who worked for 30 years for Carborundum in three different divisions, retired as plant engineer in the textile division. He now does consulting work in machine design and prototype construction of machine elements in his own development shop. He is located in Lewiston, NY. Involved in Presbyterian church work, he is also active with Masonic activities, including Shrine Hospitals for Crippled Children.

Einar Eriksen holds the post of manufacturing manager at Waldes Kohinoor Inc., Long Island City, NY. Previously, he was with Automation Engineering Laboratory, Stamford, CT. Early in his career, a leak in a village gas main destroyed a plant that he owned. While operating his own business, he built and installed the mechanical equipment for the first penicillin production facility in South Korea. For recreation, he performs with a group called the Blaue Jungs, "singing German sea chanteys for anyone who wants to listen."

1945

Reunion **May 30–June 2, 1985**

Albert Myers has been appointed to the newly created post of corporate vice president of purchasing at Lear Siegler Inc. in Mt. Clemens, MI. For four years prior to his promotion, he had been vice president of the firm's commercial products group. He has also held executive manufacturing positions with General Motors, Franklin Electric and H.K. Porter Co. Lear Siegler, headquartered in Santa Monica, CA, produces aerospace, automotive, material handling and commercial-industrial products.

1947

Edward Swierz was recently named senior bridge engineer on the headquarters staff of the state highway commissioner within the New Hampshire Department of Public Works and Highways at Concord. For the past 14 years, Swierz, who is a professional engineer, has served as bridge engineer. In his new post, he will be responsible for renewed emphasis on state bridge inspection and for developing a long-range bridge replacement policy and program for the department. He began his career as a bridge designer in 1947, and was named chief of design of interstate bridges in 1961 and assistant bridge division engineer in 1968.

1949

Thomas Coonan III writes that he is still with Du Pont's polymer products department in Chicago. He has three children in college.

Dr. **Wellen Davison,** professor of mechanical engineering at Western New England College, Springfield, MA, has been named vice president for Region I (New England) of the ASME. With Western New England College since 1958, he has served as chairman of the ME department for 12 years. Previously, he was a design engineer in refrigeration and air conditioning for Westinghouse. He has an MSME from RPI and a PhD from the University of Connecticut. A member of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, he also belongs to the Association of Energy Engineers, the American Society of Engineering Education, Sigma Xi and Pi Tau Sigma. He is a registered professional engineer in Massachusetts.

William Jacques, now retired following 33 years of federal service, spends half the year in Winchendon, MA, and half in Vero Beach, FL.

William Reeves is manager of engineering data support at GE Ordnance Systems in Pittsfield, MA.

1950

Reunion **May 30–June 2, 1985**

1953

MARRIED: Bill Nagel and Jeanne Weber on June 16, 1984, in Newtown, PA. They write they would enjoy hearing from old friends at 767 Chesham Turn, Southampton, PA 18966.

George Abdow and his brother, Ronald, now own and operate 15 Big Boy restaurants, including four in Worcester, and one in Avon, CT, which opened in July. They also own the Ivanhoe Restaurant in West Springfield and P.J. Scott's, another new venture in Chicopee. Since opening their first restaurant in 1959, business has grown from 270,000 customers to 7 million last year. Their Big Boy restaurants employ 1,275 people, including 450 full time. The business section of the Springfield paper, the *Morning Union*, ran a feature article about the Abdows last June.

1955

Reunion **May 30–June 2, 1985**

Brian Kelly, vice president of operations for Bell of Pennsylvania, was the keynote speaker at the 1984 conference of the Pennsylvania

Municipal Authorities Association in Hershey in August. His topic was "High Technology in the Telephone Industry." At Bell, he is responsible for construction, design, billing, installation and associated staff functions.

1956

Henry Dumas has joined Eastern Air Devices, Dover, NH, where he serves as sales manager. He will be responsible for directing Eastern's sales representative organizations. Previously, he was vice president of sales for General Scanning Inc., Watertown, MA. Eastern Air Devices is a major manufacturer of motors, fans and blowers.

The Emhart Corp., Berlin, CT, has appointed **David Gilda** as vice president of engineering for its hardware division. Formerly, he was manager of resident engineering and quality control at the GE small-appliance division in Allentown, PA. He had been with GE since 1968. At Emhart, he will direct and coordinate research and development of new products, product engineering and quality control programs.

Albert Palmero is a senior project engineer for Superior Electric in Bristol, CT.

Peter Stephens works as a marketing representative for the wholesale and industrial business at Exxon Co. USA, Houston.

1958

In June, Titan Chemical Inc., co-founded by company president **Harvey Berger**, began operations in Sunnyvale, CA. The firm manufactures a safety degreaser and industrial cleaner called Oil-Flo Safety Degreaser, which dissolves surface contaminants such as grease, oil, tar and asphalt. The product emulsifies the grease or smudge so it can be rinsed away. Berger was president of Diversified Electronics, selling his interests in 1981. Currently, he is director of Gifford Computer Systems. He graduated from Harvard Business School.

Paul Dalton writes that he is still with Monsanto after 26 years. Currently, he is director of technology for the fabricated products division.

William Gess, Jr. has a new post as senior consulting engineer for the Undersea Electronics Products Department at GE in Syracuse, NY.

Phil Lenz has been promoted to senior district sales engineer in the New England district of Armco's Construction Products Division. He will direct promotion and sales efforts in the state of Connecticut. In 1969, he started his Armco career as a sales engineer with the former New England Metal Culvert Co. in Cheshire, CT. In 1974, he was named district sales engineer in Wallingford. He is a registered professional engineer and belongs to the ASCE and to the Connecticut Society of Professional Engineers.

Bill O'Neil left GE last fall following 23 years of service. He is now self-employed in the computer business with two former GE employees.

Roy Pearson is employed as marketing manager at Pratt & Whitney Aircraft, East Hartford, CT.

1959

Recently, **Thomas Hill** was elected chairman of the 235-member Marlboro (MA) Democratic Committee. He is senior program manager in charge of special programs at Avco Systems Division in Wilmington. A former president of the Richer School Home and

George Washington Was Here!

William Slagle, Jr., '33, the newly elected president of the Royall House Association in Medford, MA, is a man who likes to look at the past while keeping his eye on the future.

Says Lillian Bombaci, publicity chairman at Royall House, "Bill is one of the most efficient, capable and cheerful leaders we've ever had. He's instituted many new programs."

Bill's latest "domain" is one of the oldest houses in America. "We can't prove George Washington slept here," he says, "but we know that he conferred in 'The Marble Chamber' when the house was General John Stark's headquarters."

The estate goes back to 1631, when Gov. John Winthrop was granted 600 acres on which he built a brick farmhouse with a broad view of the Mystic River. Bricks brought as ship's ballast from England in 1637 can still be seen in the house's original sections.

In 1732, Col. Isaac Royall, a Maine native who amassed a fortune in Antigua, B.W.I., purchased the house and transformed it into a choice example of Georgian architecture.

"In my opinion, nothing else like it exists in America today," Bill says. "The house is faced with different materials on each of its four sides. It has 12 fireplaces, which in the colonel's day were tended by 27 slaves.

"Royall House is an integral part of American history," Bill explains. "A Boston Tea Party lacquered Chinese tea box was formerly kept on display here and is now in the D.A.R. Museum."

Bill is retired from the Army Corps of Engineers (31 years) and the Massachusetts Division of Water Pollution Control (16 years). He is an active member of the West Medford Congregational Church, having served as church clerk for the past 18 years. He is also a past president of the Medford Council of Churches.

Examining Royall House painting in generals' conference room

School Association and a past president of the city's home and school associations, he belongs to several professional engineering associations.

Wilfrid Houde has just taken over as president and chief executive officer of ViMart Corp., Los Gatos, CA, a firm which he helped found last year. The company's laser disk display captures brief segments of 180 entertainment, educational and personal productivity software programs. A potential buyer would tap a command on a simple key pad to view software on a TV monitor in a computer store. Included among the titles are 40 of the most popular software packages for Atari, IBM, and Commodore computers, as well as Apple Computer, where Houde recently served for five years as vice president and general manager of the personal computers systems division.

John Wary is with Linde Photocure, Indianapolis, IN.

1960

Reunion **May 30–June 2, 1985**

1963

Roland Kuehn was recently appointed to the school committee in Franklin, MA. Previously, he was a member of the town finance committee. He holds a master's degree in management from Northeastern University and is employed as manager of process and energy engineering for Hollingsworth & Vose, a paper company in East Walpole.

Charles Menzigian serves as a senior engineer for AT&T Communications in San Francisco.

1964

Dr. **David Laananen** is an associate professor at Arizona State University in Tempe.

John Macko, formerly a government liaison manager for Pratt & Whitney Aircraft, West Palm Beach, FL, retired this year. He plans to "take a mid-career sabbatical traveling through the USA and Europe."

Eugene Niemi, who has a BS from BU, an MS from WPI and a PhD from UMass, has been promoted to full professor of mechanical engineering at the University of Lowell (MA). He is a registered professional engineer.

1965

Reunion **May 30–June 2, 1985**

Thomas Arcari, Sr. of Plainville, CT, has been promoted to senior engineer at Northeast Utilities. In 1969, he started with the firm as a civil engineer in the transmission and distribution group at the general offices in Berlin. In 1981, he was advanced to licensing engineer in the generation facilities licensing branch of the nuclear engineering department. A registered professional engineer in Connecticut, Massachusetts, New York and Maine, Arcari holds an MSCE from UConn.

Walter Chang has been elected vice president of General Electric Technical Services, a worldwide subsidiary of the General Electric Co. He is responsible for market development for aircraft gas-turbine products in the People's Republic of China. Prior to receiving his MSME from WPI, he graduated with a BSME from Southeastern Massachusetts University. He has been with GE for 16 years in the aircraft engine group.

Roy Cornelius, Jr. is director of support services for Newton (MA) public schools.

David Geiger was recently named manager of the Torrington Company's standard plant, Torrington, CT. Previously, he was manager of personnel/labor relations for Torrington operations. In 1965, he joined the company as a manufacturing project engineer at the standard plant. He holds a master's in management from RPI.

Paul Pearson and his family started hiking on a beginner's course a couple of years ago. This year, they will each be competing independently within their separate classes. "This is a different type of activity which we enjoy very much," he writes. He and his wife also play duplicate bridge. Last fall, Paul was recognized by the American Contract Bridge League as having fulfilled the requirements for the rank of life master.

Dr. **"Buddy" Watson** serves as a commander of the Civil Engineer Corps for the U.S. Navy. He and his wife, Titia, and two daughters reside in Port Hueneme, CA.

1966

Paul Bujak is principal engineer for Goodyear Tire & Rubber Co., Akron, OH.

Gary Dyckman has been elected vice president of Cygna Energy Services and has taken on the responsibility of general manager of the firm's Boston office.

Richard Healer is principal systems engineer at the Foxboro (MA) Company. He and his wife, Carol, have two children and reside in Dover.

Dan Maguire has been named a vice president in the Chicago office of Turner Construction Company. In 1968 he joined Turner's Boston office. In 1977 he was assigned business development responsibilities in the Chicago office, and in 1978 he was instrumental in developing the Chicago territory's Special Projects Division, which he manages. He has an MBA from the University of Chicago.

Harry Ogasian is a senior electronics engineer at Hamilton Standard in Windsor Locks, CT.

Joe Pastic, with the U.S. Agency for International Development, Department of State, is currently on assignment in Cairo, Egypt.

Chester Patch III is now contract manager for Becon Construction Co., Houston, TX.

Michael Salvini holds the post of vice president of manufacturing for North American Wire Products, a producer of high-grade carbon and spring wire.

John Tata holds the post of vice president of marketing at City Stationers Inc. in Leominster, MA.

1967

Allen Griswold holds the post of product manager at Ferranti O.R.E. in Falmouth, MA.

Walter Johnson is a member of the engineering faculty at State University of New York in Binghamton. He is also employed by IBM in Owego.

Gary Rosen has been appointed executive director of Junior Achievement of Central Massachusetts. Since 1967, he has taught chemistry at Worcester's Doherty Memorial High School. Also, he has served as coordinator of the school's SITE internship program (Students Involved in Their Education), a career education program which allows selected twelfth-grade students to supplement their traditional academic courses with unpaid internships in the community.

Dick Shaw, a high-tech electronics engineer, gives belly dancing performances on weekends. "I don't do hootchy-kootchy," he says. His dance relies on style and grace. "It's a hobby," he explains. He has a master's degree from Bryant College.

Gary Willis of Mansfield, MA, was recently elected a vice president of the Foxboro Company. He was formerly general manager of the company's analytical operations in Plymouth. In 1975 he joined the firm as a major-product coordinator with the power sales organization. Subsequently, he held increasingly responsible posts. He is a senior member of the Instrument Society of America and belongs to the Scientific Apparatus Makers' Association.

1968

MARRIED: Richard Mayer to Joan Spalding in Tamworth, NH, on June 30, 1984. Joan, who holds degrees from the University of Minnesota and the University of Michigan, is an independent film and video producer for Cultural Images Group. Mayer serves as project manager for James Rivers Graphics in Hadley, MA. He has an MBA from Western New England College.

William Belisle is now self-employed with Belisle & Associates in West Garden Grove, CA.

John Kokoszka works as manager of process engineering with GE's Noryl products in Selkirk, NY.

William McCann, Jr. holds the post of senior engineer at Boston Edison. He writes, "I'm currently on loan to INPO in Atlanta, GA."

Joseph Owens III, who received his PhD in physics from Tufts, is an associate professor at Florida State University in Tallahassee. He and his wife, Linda, have two children.

Cary Palulis has been promoted to international accounts manager for the Edwin Cooper Division of Ethyl Corp.

Marshall Taylor has been elected senior vice president of development of Ryder System Inc. Previously, he was vice president of planning and treasurer of Ryder, a $2.4 billion (revenue) transportation, distribution and business services company. With the firm since 1974, he has held a number of posts, including manager of capital planning, director of corporate planning, assistant treasurer, treasurer and vice president. Before joining Ryder, he was with

Ben Mazer for Worcester County Newspapers

Jerry Finkle at Wachusett Molding

Happiness Is Your Own Business

Back in 1961, a big manufacturer of cosmetic containers offered Gerald Finkle, '57 ME, the post of division head. He turned it down. "I decided," says Jerry, "if they were so impressed with my abilities, that I should have enough confidence in myself to start my own business."

Finkle, who had had engineering experience with Elliott Co. and Nylon Products Corp., decided that the fledgling plastics industry looked promising. "At the time, few companies knew how to convert metal and glass parts to plastic," he explains. "It seemed like a good place to start."

So, with $18,000 in capital, which provided him with a 1,600-square-foot building and a single molding machine, Jerry Finkle launched Wachusett Molding Company in West Boylston, MA. Today, because of his commitment and dedication, the company has expanded to 50,000 square feet, 31 machines and 75 employees, who manufacture as many as 40 million parts a week.

After the first ten years, the firm became prosperous. Finkle declares, however, that the most rewarding part of building his business has been the sense of accomplishment, not the monetary value. "I love my work," he says. "I found out early on that I didn't enjoy working for somebody else. I like being my own boss."

The future of Wachusett Molding, he says, is in the manufacture of medical/pharmaceutical components such as vials, tubes, kits and personal-care products. Already, the West Boylston plant is too small. Last winter, he opened a second plant in Worcester.

Finkle, who heads the WPI Alumni Fund Board, is past president of the Central Massachusetts Amateur Radio Association, a member of the American Radio Relay League, a past master of his Masonic lodge and a senior member of the Society of Plastic Engineers. He and his wife, Cynthia, have three sons.

Mobil Oil Corp., where he was responsible for systems and financial analysis. He has an MBA from Babson. Active in civic affairs in the Miami (FL) area, he serves as treasurer and as a member of the executive committee of the Coconut Grove Playhouse.

1969

MARRIED: Kenneth Amend to DebraAnn Bisceglia on June 23, 1984, in Worcester. A collateral specialist for Shawmut Bank, she graduated from Worcester State College. Kenneth graduated from Ursinus College, holds a master's degree from WPI, and teaches at St. Peter-Marian High School in Worcester.

Stephen Legomsky continues as associate professor of law at Washington University Law School in St. Louis, MO.

Daniel Lorusso is principal consultant with Lorusso Associates in Pittsfield, MA.

Matthew Neclerio holds the position of president at Paramount Electronics Manufacturing Co. and Paramount Sales & Consulting Inc., Pompano Beach, FL.

John Szostek is now sales and marketing manager at TBV Inc., in Sutton, MA. The company manufactures specialty ball valves. The Szosteks and their 4-year-old son, Jason, and baby daughter, Corin, reside in Rehoboth.

Paul Wolf is manager of traffic engineering and systems planning at the Northeast Ohio Area-Wide Coordinating Agency. He is also a vice president of the Great Lakes Region Federation of Jewish Men's Clubs.

1970

Reunion **September 28, 1985**

Pramod Koradia was recently appointed to the post of manager of Selexol technology for Norton Company's chemical-process products business in Akron, OH. He is responsible for research, development and quality control for the Selexol solvent process for purifying natural and synthetic gases. With Norton for 14 years, his most recent position was manager of product research at the pilot plant facility at Norton's Chamberlain Laboratories in Stow. He has an MS from WPI, belongs to the AICE, and was co-inventor of several patents relating to a catalyst having application in emission control.

John Malley is now generation planning engineer for New England Power Service Co.

Robert Smialek is vice president of American Protection Insurance Co., vice president of Kemper International Insurance Co., and an officer with principal companies in the Kemper group. He has an associate's degree in management, risk management, and loss control management and a CPCU from Insurance Institute of America.

Bohdan Sywak serves as a regional staff industrial engineer for DCASR (U.S. government) in Philadelphia. He has an MBA from Temple University.

1971

MARRIED: Raymond Biszko and Lauri Anne Elaine West on April 29, 1984, in Fall River, MA. She attended Jackson College, Providence College and the American Institute of Banking. Prior to joining the management of Raymond's firm, she was a manager of Fleet National Bank. Raymond is president of Advance Engineering Inc. and vice president of Guaranty Construction Co., both located in Tiverton, RI. . . . **Gregory Dickson** and Susan Hearn in Midland, MI, on July 14, 1984. Greg is manager of industrial hygiene at Dow Chemical Co.

George Bakevich serves as general manager at Interstate Nuclear Services Corp., Springfield, MA. A certified financial planner, he holds an MS in nuclear engineering from the University of Utah.

Jeoffrey Berg works as a staff engineer for Polymer Engineering in Boulder, CO.

Neil Collins recently formed a consulting firm, Empire Engineering, in Syracuse, NY. The company provides power systems engineering, economic and management consulting services to the utility industrial business sectors. He holds an MGS and an MBA from WPI and is a graduate of WPI's School of Industrial Management.

Alan Kaechele holds the post of manager of product marketing at Spectragraphics in San Diego, CA.

Douglas Keily is international project manager at Combustion Engineering in Windsor, CT.

John Landahl, who has an MBA from Nich-

ols College, Dudley, MA, is a civil engineer with the U.S. Army Corps of Engineers, Washington, DC.

Vincent Pace, who has an MSEE from Drexel and a JD from Temple University, serves as a patent adviser for the Naval Air Development Center in Warminster, PA.

Marshall Shepard works as a project engineer at Torrens Industries in Fyshwick, Australia.

Larry Sniegoski has changed his surname to "Snow."

David Winer is a project engineer at Orion Research Inc. in Cambridge, MA. In May he received his MBA from Boston College. He also has an MSEE from Northeastern.

1972

In April, **Charles Brine** co-organized and co-chaired a joint U.S.-Japan Seminar on Chitin Chitosan and Related Enzymes, sponsored by the National Science Foundation and its Japanese equivalent, JSPS. In September, he co-edited an Academic Press hard-bound volume of the proceedings. These activities follow his participation as a session chairman of the Second International Conference on Chitin and Chitosan, held in 1982 in Sapporo, Japan. He is the inventor on 16 U.S. and foreign patents on this broad subject, several of which (regarding biodegradable surgical sutures) have been licensed for worldwide commercial development. He earned an MS and a PhD and did postdoctoral studies at the University of Delaware.

Robert Colp, who is currently "on loan to Aramco in Saudi Arabia," expects to return to Massachusetts in December.

Michael DiBenedetto, a supervisor of power resources at Blackstone Valley Electric Company, spoke on the topic "Energy Sources—Present and Future" at Woonsocket (RI) Junior High School in May.

Andrew Lee has been elected to a three-year term on the board of directors of the Northeastern Loggers' Association. The association includes loggers and others employed in the forest industry from Maine to Minnesota and south to Maryland and Missouri. Lee has owned his own timber harvesting business, Lee Forest Products Co. Inc., since 1981. Previously, he was a commercial real estate manager in suburban Boston. He has served on the Plymouth Town Forest Committee and on the Massachusetts Forest Cutting Practices Act Interim Committee.

1973

MARRIED: Capt. **David Bedard,** USA, to Angelika Turner in Warwick, RI, on May 31, 1984. Angelika was educated at Qualifizierter Abschluss in Germany. Bedard, formerly stationed at Hunstville, AL, is now in Wurtsburg, Germany. . . . **Michael Zack** and Sherry Umberfield in Westerly, RI, on May 27, 1984. She graduated from Holyoke College, Holyoke, MA, and Northwestern University and is assistant vice president of New England Mutual Life Insurance Co. Zack, who also holds a degree from Northwestern, is chief executive officer of Launder-Rite Inc., Wakefield, MA.

David Brown, who is with the Sturtevant division of Westinghouse in Hyde Park, MA, has received the company's highest engineering award. He is one of 30 Westinghouse scientists and engineers selected to receive the George Westinghouse Award for outstanding engineering achievement. He was cited for helping to develop a fan armoring system that resists erosion and can be easily replaced in the field. With the firm since 1973, he joined the Sturtevant division in 1979. He has an MSME from Villanova.

Robert Levi holds the post of energy services engineer at Borg-Warner Air Conditioning Inc., San Leandro, CA. He is also pursuing his MBA part time at California State University in Hayward.

Kenneth Lexier was recently named assistant superintendent of schools in the Skowhegan, ME, school district. Previously, he was a school principal in the Wells-Ogunquit area, and a reading specialist in Uxbridge and Attleboro, MA. Also, he had taught math and reading in the Worcester, MA, secondary schools and had been an instructor in the WPI and Assumption graduate schools. Currently working for his MBA at the University of Southern Maine, he holds an MA from Assumption and a doctorate in education from BU.

Wallace McKenzie, Jr. has been appointed communications director by (MA) State Representative Steven Angelo for his 1984 election campaign. He has been active in Saugus political affairs for many years, is a member of the local finance committee and has served in the Town Meeting and on various town advisory boards. A consulting manager for Management Decisions Systems, Waltham, Angelo has an MBA from RPI.

Richard Stockdale is a senior software engineer at Digital Equipment in Littleton, MA.

John Wolkonowicz serves as manager of competitive strategy for Ford Motor Co., Dearborn, MI. He is a graduate of MIT's Sloan School of Management.

George Yesowitch holds the post of manager of special projects at Liquid Air Corp., San Francisco.

1974

BORN: to **Jim** and **Lexy Chito Ferraris, '77,** their third daughter, Christina Lynn, in May. Lexy is with GE in Plainville, CT, and Jim works for the Trane Co. in Avon.

Recently, **Paul Colby** received his PhD in physics from the University of Wisconsin at Madison. He is now a research associate in the physics department at Duke University, Durham, NC.

Linda Fritz has been appointed an assistant professor of physics at Franklin and Marshall College. Previously, she was an assistant professor of physics at Northeastern and a research assistant at Stanford University, where she received her PhD in 1981. She has written ten papers on her research findings for presentation at professional conferences or for publication in journals.

Michael Kosmo recently joined Schofield Brothers, Framingham, MA, as a project manager. He is a registered professional engineer and has eight years' experience in site planning of residential, commercial and industrial projects. He will supervise site planning projects and coordinate regulatory agency approvals. Formerly, he was a project manager with Merrimack Engineering Services in Andover. He is currently enrolled at Babson College, pursuing his MBA.

John Mathews has been promoted to senior engineer at Northeast Utilities in Connecticut. Since joining the company in 1980, he has held several posts, including that of project engineer for the Mt. Tom Station coal conversion, a 148,000-kilowatt NU generating station in Holyoke, MA.

Hugh McAdam was recently named vice president in charge of marketing and engineering for the International Paper Box Machine Co. of Nashua, NH. Previously, he was chief engineer, responsible for R&D as well as customer service engineering. Starting with the company in 1974 as a project engineer, he was later promoted to chief engineer. He has an MBA from Babson.

Richard McGuire is with Taylor, Wiseman & Taylor in Mt. Laurel, NJ.

Charles Nickerson is a staff engineer for Haley & Aldrich in Portland, ME.

Richard Piwko has been named Outstanding Young Engineer of the Power Engineering Society of the Institute of Electrical and Electronics Engineers (IEEE). As application engineer with GE's Electric Utility Systems Engineering Department in Schenectady, NY, Piwko was recognized for outstanding technical contributions in the research, development and practical application of new high-voltage direct-current (HVDC) transmission system controls. The successful application of HVDC will reportedly save millions of dollars for the electric utility industry. With GE since 1976, Piwko is responsible for studies of power system performance and the development of improved control systems for GE's generation and transmission products.

Lt. **Linda Woodward** serves as a project manager with the U.S. Air Force at Eglin AFB, FL.

1975

Reunion **September 28, 1985**

MARRIED: Robert Cummings to Martha Dungan on March 24, 1984, in Albuquerque, NM. Martha graduated from Albuquerque Career Institute and is employed as a paralegal. Robert serves as senior operations engineer at the Public Service Company of New Mexico. . . . **Ronald Simmons** and Jane Albright, recently. Jane is a nuclear engineer at Puget Sound Naval Shipyard in Bremerton, WA. Ronald was promoted to lead senior engineer with the Westinghouse-Bettis atomic power laboratory resident office in Bremerton in January.

BORN: to Anne and **Peter Hatgelakas** a son, Brian, recently. Peter is a senior exploration geologist for CNG Development Co., Pittsburgh.

Cliff Ashton has been promoted to senior engineer in the generation mechanical engineer department of Northeast Utilities. In 1979, he joined the firm as an associate engineer and was advanced to engineer the following year. He

has an MSME from RPI and is currently studying for his MBA at Rensselaer. Active in professional engineer associations, he belongs to Pi Tau Sigma and Tau Beta Pi engineering honor societies.

Michael Aspinwall has been named director of corporate planning at Pitney Bowes Inc., Stamford, CT. He joined the firm in 1981, serving most recently as manager of corporate strategic planning. Previously, he was associated with FMC Corporation, Philadelphia. He has an MBA from the University of Chicago.

Joseph **DelPonte** works for BDM Corp. in Huntsville, AL.

John FitzPatrick, who received his MBA from Rutgers last year, is currently a staff engineer for Exxon Research and Engineering Company in Colombia, South America.

David Giddings serves as a senior chemist at Nalco Chemical Co. in Sugar Land, TX. He has an MS and a PhD from Brandeis.

Robert Hart continues as a software engineer with the U.S. Army Electronics R&D Command's Tactical Software Support Center. His wife, Linda, is a graphic designer with Bell Labs.

Kenneth Howell is a collection coordinator at UConn Health Center, Farmington, CT.

Gary **Kiontke** has been promoted to associate actuary at Monarch Life Insurance Company, Springfield, MA. With Monarch since 1977, previously he was assistant actuary. He attended the University of Connecticut School of Insurance. His professional associations include the American Academy of Actuaries and fellowship in the Society of Actuaries.

James Qualey III has just received his PhD from Penn State.

Kazem Sohraby, who holds a PhD in electrical engineering from Brooklyn Polytechnic Institute, is a member of the technical staff at AT&T Information Systems in Somerset, NJ.

Wayne Stratton is an electrical engineer with the Federal Communications Commission in Washington, DC.

Earle Vickery III is a design engineer with Micron Technology in Boise, ID.

1976

MARRIED: Paul Jacques to Jane Sienkiewicz on June 23, 1984, in Rochester, NY. Jane has an associate's degree in health sciences from Monroe Community College, Rochester. Both she and Paul are employed at Kodak. . . . **Dick Lessard** and Jennifer McOmber on June 2, 1984. Jenny has a bachelor's degree in social work from Virginia Commonwealth University and works for the Pennsylvania Avenue Development Corporation. Dick is a senior associate with IMR Systems Corp., Falls Church, VA. . . .**Wayne Mandrus** and Debra Elmasian on May 26, 1984, in Springfield, MA. She graduated from Monson Academy and is regional manager of Helen Olevson Inc. in Providence, RI. He is a computer engineer for Bedford Control in Acton.

Lt. Col. **William Baker** writes that he is currently deputy district engineer of the Japan district of the U.S. Army Corps of Engineers. He is responsible for executing all design and construction contracts for military construction projects on mainland Japan and Okinawa. In Japan, the Corps services the Army, Navy, Air Force and Coast Guard. In December, he plans to attend the Defense Systems Management College at Ft. Belvoir, VA.

Doug Brown, who just received his MS in technology management from Polytechnic Institute of New York, is a consultant with C.H. Kline & Co. Inc. in Fairfield, NJ.

Jeremy Brown has been elected assistant vice president of group pension product development at State Mutual Life Assurance Company, Worcester. He joined the firm in 1976 and was named director of group pension product development in 1981.

Greg Dubin is product manager for Oxle Fuel Co., Windsor, CT.

Daniel Garfi is a partner in D.D.J. Associates Inc., Monmouth Junction, NJ. He has an MS in computer science from Fairleigh Dickinson University.

In February, **K. Alan Kelley** joined Federal Mogul Corporation's National Grinding Wheel Division, North Tonawanda, NY, where he serves as a product development engineer.

Nancy Sauberman, PhD, is a third-year medical student at St. George's University School of Medicine, Grenada, West Indies.

Dr. **David Sawyer** continues as a senior research engineer with Chevron Research Co., Richmond, CA. He has degrees from Clark and the University of Illinois.

Robert Schildt is now a liquor store assistant manager for the Commonwealth of Pennsylvania. He resides in Rock Ledge.

John Smith, who received his MD from SUNY-Stony Brook this year and his PhD from Roswell Park Memorial Institute in Buffalo, NY, last year, is currently a resident in internal medicine at Yale-New Haven Hospital, in New Haven, CT.

Paula Stratouly is studying for her MS in finance at Texas A&M University.

Steve Tuckerman has been accepted as a full member of the American Institute of Certified Planners.

Having spent the past two years as a postdoctoral fellow at the IBM Research Lab in San Jose, CA, **Edward Whittaker** is now assistant professor of physics at Stevens Institute of Technology in Hoboken, NJ. He and his wife, Suzanne, are the parents of a two-year-old daughter, Justine. Edward writes, "Justine is a native Californian."

1977

MARRIED: Michael Bloom and Linda Moskowitz in East Rockaway, NY, on July 31, 1983. Linda has a master's in social work and public administration from Syracuse. Michael has a new job as senior software engineer with Prime Computer in Framingham, MA. . . .**Paul Hajec** and Brenda Ayers in Georgetown, MA, on January 7, 1984. Brenda is completing her degree in English at Salem State College, where she is editor of *Soundings East*, and serves as a substitute teacher in Georgetown. Paul, a staff engineer with the consulting firm, HMM Associates, Concord, has a master's degree from Northeastern. . . . **Matthew Ward** and Meredyth Wessman on September 17, 1983. He is with the robotics systems research department at AT&T Bell Labs, Holmdel, NJ.

Gary Babin has been named assistant superintendent of the electric division for the Wellesley Department of Public Works. He has an MBA from the University of New Haven, and for six years he was employed with the United Illuminating Company of New Haven, CT. His most recent job was with the University of Connecticut's Office of Facilities in Storrs.

Stann Chonofsky was recently promoted to manager at Arthur Andersen & Co., Boston, an international public accounting and consulting firm. As a manager, he will continue in the consulting practice of the Boston office, specializing in service to distribution and public utility organizations. In 1977 he joined the company. In 1982 he received his M.Sc. from Sussex University, Brighton, England.

James Gado recently received his MS from MIT.

In July, **Keith Harrison** was promoted to area engineer with the Federal Highway Administration and transferred to Trenton, NJ.

Mark Knights is a senior physicist with Sanders Associates in Merrimack, NH.

Jerry Melcher has a new post as a senior applications engineer with Acurex, Autodata Division, Mountain View, CA. Acurex manufactures measurement acquisition and control systems and rotating machinery instrumentation equipment. He writes, "Just purchased a home in San Carlos Hills on the beautiful San Francisco peninsula."

Steven Terrell-Perica is a kavai epidemiological specialist with the Hawaii Department of Health in Lihue. He has an MA in physiology from San Francisco State University and a degree in epidemiology from the University of Hawaii.

Brad Prouty is a senior engineer for United Technologies Diesel Systems in Springfield, MA.

Jeffrey Wessels serves as engineering specialist with Northrop Corp., Pico Rivera, CA.

Gilbert Wilson holds the position of engineering section manager at Varco-Pruden Buildings in St. Joseph, MO.

1978

MARRIED: Daniel Durbak and Debra Stopera in Schenectady, NY, on June 2, 1984. Debra graduated from Cohoes High School and is a legal secretary. Durbak works for General Electric. . . . **Richard Ruscito** to Donna Yates on May 6, 1984, in Cranston, RI. Donna graduated from Rhode Island College. Richard is with Olin Corporation, Tallahassee, FL.

Richard Bielen works for FirePro Inc. in Wellesley Hills, MA. He holds his MS in fire protection engineering from WPI.

Robert Brosnahan serves as a senior product development engineer at Richards Medical Co., Memphis, TN.

Currently, **Paul Cody** holds the post of engineering supervisor at Westinghouse in Hillside, NJ.

Ron Fish is senior manager of technical services at Teledyne Systems Co., Northridge, CA.

Richard Gottlieb works as an engineer-estimator at Perini International Corp., Framingham, MA. He is studying for his MBA at Babson College.

Thomas Gudewicz is a candidate for an MD degree at the University of Texas in Galveston.

Man in Control At Livermore

"Basically, I run a control system which attempts to keep bottles from leaking," says Bob Pancotti, '78 CS.

Pancotti, who also holds an MSCS from WPI, is not talking everyday control systems and bottles. He's talking a $17 million control center and bottles containing pure energy.

"We try to keep the energy inside the bottles," he adds, "with twin 375-ton magnets."

Last fall, *Fortune* magazine ran a photo of Bob in the control room at Lawrence Livermore (CA) National Laboratory. He serves as team chief for the man-machine interface, Integrated Control and Diagnostic Systems Group, for the Mirror Fusion Test Facility (MFTF).

"The fusion community is trying to get fuel from sea water for energy products," he explains. "One gallon of sea water contains the energy equivalent of 300 gallons of gasoline. It could solve our future energy needs."

Livermore's MFTF is the largest and most expensive ($226 million) mirror fusion research project in the world. Bob is involved with the facility's computerized control and monitoring system (SCDS), which controls more than 10,000 devices and monitors more than 25,000 sensors.

Mitch Epstein

Bob Pancotti in control room

"SCDS will provide physicists with a method of studying machine and plasma behavior by acquiring up to 8 Mbytes [million] of diagnostic information every machine cycle, as often as every five minutes," Bob says.

The control room houses a state-of-the-art man-machine interface composed of 14 touch-sensitive color graphics screens and 27 additional color graphics screens for monitoring.

"With touch screens an operator can change current or voltage rates by touching the screens at certain points," Bob reports. "Changes to the control system, as required in an experimental environment, can be made quickly by writing a little software for new buttons." Computerized controls, he says, are the wave of the future. And the new wave may well help scientists draw limitless energy from the seas.

Capt. **Peter Hunt,** USAF, is chief of launch vehicle integration for the space division at Los Angeles AFS, CA. He has an MS in systems management from USC.

John Johnson has been awarded a Santa Barbara (CA) Research Center faculty development program fellowship. Johnson, who is working for his doctorate at the University of California at Santa Barbara, was selected because of his academic record and his commitment to becoming a university professor upon obtaining his degree. Previously, he was with Raytheon in Massachusetts.

Gregory Koss has joined Analog Devices Inc. in Norwood, MA, as marketing manager of the component test systems division. He is responsible for product planning, applications engineering, sales support, training and publications. Previously, he was product line manager at Computer Devices in Burlington.

Joseph Maslar is an account representative with Burroughs Corp. in East Hartford, CT.

Laura Mattick holds the post of production manager at Foote Mineral Co., Exton, PA. She is married to **Michael Poirier, '79.**

Thomas Medrek recently received his master's degree from Amos Tuck School of Business Administration at Dartmouth College.

Lucian Ograbisz works as principal electrical engineer at Sanders Associates, Nashua, NH.

Peter Rowden works for Mass Comp. in Westford, MA.

Last year, **Martin Schulze** received his PhD in nuclear physics from MIT. Currently, he is on the visiting staff at Syracuse University.

Bettina Tuttle was recently promoted to engineering manager at Polyclad Laminates Inc. in Franklin, NH. She is responsible for all process, product and facilities engineering and will also help oversee the computerization of engineering systems, as well as ensure conformance to OSHA and EPA standards and regulations. Formerly she was a process development engineer for GE and a research engineer at Exxon. She joined Polyclad's Millbury (MA) plant as a process engineer in 1983. In her spare time, Tina enjoys athletics, coaches sports and works with the handicapped and underprivileged.

Karlis Viceps is self-employed in Taos Ski Valley, NM, where he does solar-earth shelter consulting and residential design.

1979

MARRIED: Stephen Clarkin to Cynthia Welch in Mendon, NY, on May 26, 1984. Cynthia graduated from SUNY, Albany, and is employed at RIT's College of Business. Stephen, who received his MBA in marketing from Cornell in May, is with General Mills in Minneapolis. . . . **Cynthia Connor** and Keith Tomko in Holyoke, MA, on April 28, 1984. Cynthia is with Westinghouse in West Mifflin, PA. Keith graduated from Pennsylvania State University and is also an engineer with Westinghouse. . . . **Gail D'Amico** and Mark Mason on May 12, 1984, in Middletown, CT. Gail has an MA from Mount Sinai School of Medicine in New York City. Mark has a BA from Bowdoin and an MS from the University of Connecticut. Both are in their final year at Tufts University School of Veterinary Medicine in Boston. . . . **Judith Dorkin** and Craig Pendergraft on May 19, 1984, at Hammersmith Farm in Newport, RI. Judith is pursuing a master's degree at the University of New Haven and has worked for Southern New England Telephone Co. for the past five years. She will be working for Pacific Telephone as an assistant manager in San Jose, CA. Craig graduated from Humboldt State University, Arcata, CA. He is an accounts manager for Synercom Technology Inc. . . . . **Alan Masse** and Kathleen Murphy in Pawtucket, RI, on May 19, 1984. Kathleen graduated from Middleboro High School. Both she and Alan work for the Kemper Group.

BORN: to Cynthia and **Glenn Braunstein** a son, Glenn Jr., on September 25, 1983. Glenn, a development engineer for Goodyear Tire & Rubber Co., is on a temporary six-month assignment at the Goodyear plant in Luxembourg. He has an MBA from the University of Akron (OH).

Paul Blackmer is an industrial engineer with GE in Utica, NY.

Michael Blaney works for Thermo Electron Corp.

Paul Burgarella is now a project engineer at Teledyne Philbrick, Dedham, MA.

Stephen Caputo serves as sales manager for the eastern region at GE capacitor products department in Hudson Falls, NY.

Jane Estey of Old Saybrook CT, was recently named a structural engineer at Hoffmann Architects. A professional engineer, she is responsible for the structural design and engineering of rehabilitation projects. She is a master's candidate at UConn.

Tom Girotti is an associate engineer in the planning department at Virginia Electric &

Power Co., Norfolk. He and Deb are the parents of two children and reside in Newport News, VA.

Capt. **Robert Gregorio** serves as assistant division transportation officer with the U.S. Army, 3rd Armored Division, Frankfurt, Germany.

Brian Hallett works for Westinghouse-Bettis, West Mifflin, PA.

Thom Hammond is now a senior sales engineer for Masoneilan Marketing International Company. He is on a two-year contract in Saudi Arabia selling to refineries and Aramco.

Arthur Hughes has been transferred to Alice, TX, where he is currently open-hole operations manager for Dresser Industries. He resides in Corpus Christi.

David Johnson, who is vice president of RWP Johnson Associates Inc., Bridgewater, CT, is studying for his bachelor's degree in theology at The Way College of Emporia, KS.

Michael Josbaecher works for Digital Equipment and is currently traveling in Europe.

James Korte is an aero- and bias-tire compounder for Goodyear in Danville, VA.

Claire LaChance, who has her MS in systems engineering from the University of Pennsylvania, continues as a member of the technical staff at the Mitre Corp., Bedford, MA. She is married to Jeffrey Toth.

Mark Lovington works for Concord Data Systems in Waltham, MA, where he is a member of the technical staff.

Carl Nyerick received his MS in medical physics from the University of Pittsburgh in April. Currently, he is a medical physicist with Gastroenterology Medical Associates in Pittsburgh.

Peter Pappas serves as senior software engineer at Stratus Computer, Natick, MA.

Michael Poirier, formerly a consultant for Arthur Andersen in Philadelphia, was recently named a manager for Sigma Data Systems, a computer consulting firm in the Wilmington, DE, area.

Steve Rusckowski has received his MS in management from MIT's Sloan School of Management. His degree concentration was in corporate strategy and marketing, and his thesis was entitled "Financial Reporting: Liberal or Conservative." Prior to entering MIT, he was production manager for three years at Procter & Gamble Mfg. Co., Quincy, MA. Currently, he is a financial-planning manager with Hewlett-Packard's Medical Products Group. The Rusckowskis, who have a daughter, reside in Waltham.

Sanford Selman is manager of energy utilization technology at Edison Electric Institute, Washington, DC.

Susan Titherington continues as a software engineer at Compugraphic in Wilmington, MA.

John Tracy is involved with institutional equity sales at Morgan Stanley & Co., New York City.

1980

Reunion **September 28, 1985**

MARRIED: Michael Ramadei to Michele Celentano on June 1, 1984, in Hamden, CT. She holds a BA in history from Yale and a JD from St. John's University, Jamaica, NY. She was admitted to the Connecticut Bar last November. He has an MBA from Rivier College, Nashua, NH, and is pursuing an MSEE at the Hartford Graduate Center. He is with Phillips Medical Systems in Shelton. . . . **Pamela Thomas** to James Cadorette, last fall. She is a quality engineer at American Bentley Labs in Irvine, CA.

BORN: to Eileen and **Art O'Leary** a second son, Theodore Richard, on May 23, 1984. Art still works for Artisan Industries in Waltham, MA. The family resides in a new house in Leominster.

James Barker is a project engineer at Exxon Research & Development Labs in Baton Rouge, LA.

Robert Dreyfoos has been named plant manager of Photo Electronics Corp., West Palm Beach, FL. His father is president of the firm, which manufactures electronic equipment used by professional color photofinishing laboratories. Robert joined the firm as a design engineer in 1980. He headed the team that developed the company's newest product, PVAC, the professional video analyzing computer, which along with the firm's other products is marketed by Eastman Kodak. Photo Electronics is the parent company of the ABC-TV affiliate in West Palm Beach, Laser Color Laboratory and the Sailfish Marina.

Charles Dyke is employed as a senior chemical engineer at Texaco Inc. in Glenham, NY.

Margaret Fernald works for Mitre Corporation in Bedford, MA.

Arman Garakani works for IBM as an associate engineer in Poughkeepsie, NY.

John Hassey is a senior software engineer for Data General, Westboro, MA. He and his wife, Donna, have two children and reside in Worcester.

Arthur Huggard is a senior manufacturing technology engineer for Monsanto Chemical in Indian Orchard, MA.

Leo Kaabi is a manufacturing management trainee for R.R. Donnelley, Torrance, CA.

Don Maki holds the post of plant engineer at Borden Chemical, Diball, TX.

Ronald Marshall, who graduated with his master's degree from the University of Vermont in May, received the 1984 Graduate Award in Statistics on Honors Day at the university.

Jay Meisner is a graduate student at Einstein College of Medicine in Bronx, NY.

Robert Myers works as a contract administrator for Parsons Brinkerhoff Construction Services in New York City.

Mark O'Neil recently completed his first year at Harvard Business School.

Matthew Powell is a member of the technical staff at the Mitre Corporation in Bedford, MA.

Chartsiri Sophonpanich, who recently received graduate degrees in chemical engineering and management from MIT, is now a management associate at Citibank, New York City.

Mark Tino is now a manager at Arthur Andersen & Co., Boston. He has been with the international public accounting and consulting firm since 1980. As a manager, he will continue in the consulting practice of the Boston office, specializing in service to distribution and manufacturing organizations. He and his wife, Pamela, reside in South Easton, MA.

Geoffrey Ward works as a thin-film process engineer at Analog Devices Semiconductor, Wilmington, MA.

Lisa Wylie is an information systems staff member at AT&T Technologies in North Andover, MA.

Daryoosh Yaghmaei, who works in the gold mining industry, has been named a laboratory analytical chemist at Pilbara Laboratory, a division of Macdonald Hamilton & Co., Kalgoorlie, Australia.

1981

MARRIED: Antonio Cabral to Janet Gigli on April 28, 1984, in Manchester, CT. A manager for Rite-Aid Corporation, Janet graduated from Robert Morris College, Pittsburgh, PA. Cabral is a materials engineer for Pratt & Whitney Aircraft, East Hartford, CT. . . . **Robert Daley** and Susanne Hoffman on July 21, 1984, in Milford, CT. Susanne, an associate with Brian Alden Inc., graduated from Salve Regina College, Newport, RI. Robert is vice president of Savery Tool Sales Co., West Hartford. . . . **Paul Filosa** and Donna Rodeschin in Glen Burnie, MD, on May 5, 1984. Donna has a BS degree in mathematics from the College of Charleston, SC. She and Paul are both employed as mathematicians for the Department of Defense in Washington, DC.

MARRIED: James Martin and Holly Graham in Great Barrington, MA, on July 7, 1984. Holly, a special-education teacher in the Upland School District, graduated from Wheelock College. Martin is a field sales engineer with Automatic Switch Co. . . . **John Nykyforchyn** and **Janice Millard, '83,** on April 7, 1984, in Cohasset, MA. Janice is employed by General Dynamics-Electric Boat, Groton, CT, and John serves as a resident manufacturing engineer at United Nuclear. . . . **Michael Thompson** and Ann-Marie Murray in Worcester on April 28, 1984. Ann-Marie, a registered nurse, graduated from Worcester City Hospital School of Nursing and Worcester State College. Michael is a sales engineer for Westinghouse Electric Corporation in Fayetteville, NC.

Wayne Barry of Paxton, MA, who was a volunteer with Big Brothers/Big Sisters of Worcester County as a student at WPI, has been a Big Brother to Brian Maddox since 1977. Last year, Brian was joined by Tavie Johnson. Wayne was recently married, but says that his wife is very supportive of his Big Brother activities. Professionally, Wayne works in residential and commercial real estate management and is assistant varsity coach and coach of the junior varsity basketball team at Doherty High School in Worcester.

Joe Bellas works as a sales engineer for Gulf Oil, East Providence, RI.

Robert Breault has been promoted to senior industrial engineer at Chesebrough-Pond's Inc., Clinton, CT.

Jeanne Coughlin works as a systems engineer at IBM in Paramus, NJ.

Joseph Des Jardins works for Motorola in Ft. Lauderdale, FL.

Gary DiFederico serves as a project engineer at Hamilton Standard, Windsor Locks, CT.

Dan Doherty Jr. is currently a senior software engineer at DEC in Nashua, NH.

Susan Hoffma has joined the Peace Corps and is serving in Tanzania.

David LaPotin is currently a student at Carnegie-Mellon in Pittsburgh.

Michael Przybyla is employed as an assistant planner at Pioneer Valley Planning Commission, West Springfield, MA.

Art Shorrock is a quality assurance engineer with Hitchiner Mfg. in Milford, NH.

Gary Winer has received his JD degree, *cum laude,* from New England School of Law. As a law student, he used his technical background while working as a law clerk for the Boston firm of Weingarten, Schurgin, Gagnebin, and Hayes, which specializes in patent, copyright and trademark law. He also served as president of the New England School of Law International Law Society, and he was a member of the school's law team that competed in the Jessup International Moot Court Competition.

1982

MARRIED: Gary Baier and Jennifer Krusen in Harvard, MA, on June 16, 1984. Jennifer graduated from Simmons College and is now a graduate student at UMass. Gary, who works at GE in Pittsfield, is enrolled in a master's program at RPI, Troy, NY. . . . **David Batbouta** to **Ellen Dusseault, '83,** in Worcester on May 19, 1984. Ellen serves as a software engineer for Digital Equipment Corp., Nashua, NH. David is with Killsman Instrument Co., Merrimack. . . . **Frank Bilotta, Jr.** and Joan Spierdowis on May 5, 1984, in Norwood, MA. Joan graduated from UMass, Amherst, and is employed at Rentacolor Corp. Frank works at Data General. . . . **Martin Riccitelli** and Karen Tatro in Westfield, MA, on June 30, 1984. Karen received her BSME from Western New England College and is an applications engineer for Prime Computer, Windsor, CT. Martin is with United Technologies Diesel Systems.

MARRIED: Barry Rosen and Deirdre Sullivan in Westwood, MA, on June 2, 1984. She is a programmer for GE in Lynn. Barry serves as a quality control engineer for GCA in Andover. . . . **Elizabeth Sydney** and **James Krieger, '85,** at Higgins House, Worcester, on May 20, 1984. She is an industrial engineer with New England Electric in Westboro, MA, and is currently pursuing her MBA. He is majoring in computer science. . . . **James Tata** to Patricia Valone in Warren, PA. Patricia graduated from Allegheny College, Meadville, PA, and received her master's degree from the University of Rochester. She is employed by the University of Rochester Medical Center in the department of radiation biology and biophysics. Tata, who received his master's degree from the university this year, is currently a candidate for a PhD in chemistry.

Robert Arbogast, a senior majoring in Greek at Calvin College, Grand Rapids, MI, has been awarded the college's Board of Trustees Scholarship for 1984-85. He intends to enter Calvin Seminary and become a minister of the Christian Reformed Church. Currently, he tutors Greek in the Calvin classics department. He and his wife, Janet, have a daughter, Kathryn.

Frederick Berbig holds the position of project engineer for Los Angeles County Sanitation Districts, Whittier, CA.

Modeling in Milan

Setting the Pace In Fashion

Big-time male modeling. Glamorous. Right? Easy. Right? What a way to make a living!

Steve Pace, '78, laughs as he discusses people's reactions to his part-time profession. "It certainly sounds glamorous to be sent off to Paris and Milan for months at a time to model high fashion," he admits. "I always enjoy the experience, and occasionally I get to keep the clothes. But, easy? Sometimes, I work from 6 in the morning until 9 o'clock at night!"

Steve, who regularly is a commercial real estate broker for Ashwill Schneider in San Jose, CA, tries to play down the glamorous aspects of modeling. But when your clients are such world-famous names as Missoni, Fiorucci, Puma, Panchetti, *Men's Vogue Italian* and *Playboy Italian,* the glitter can't help but come through the seams.

"I like to model on location," Steve says. "It's more enjoyable than doing routine studio assignments. It gives me a chance to travel to new places and meet interesting people. For example, while in Europe recently, I worked for the major magazines, designers' fashion shows and for TV commercials."

Back in the U.S., his modeling clients, mostly in the San Francisco area, are Macy's, Hastings, Emporium Capwells, Neiman-Marcus and J.C. Penney. Recently, he modeled for a Paul Masson winery brochure.

As far as the future goes, Steve plans to continue dealing with commercial-industrial real estate (RE) in the Silicon Valley ("I fell into RE four years ago."), and to take acting lessons with an eye toward doing more TV commercials. Eventually, he might even go into acting.

"Meanwhile, I'll continue to model locally," he says. "But if I get another opportunity to model in Europe, you can be sure I'll take it!"

Peter Booth is an automation engineer at Northrop Corporation in Norwood, MA.

John Browning is manager of Anaconda-Kaye Sports in Kingston, NY.

Peter Fanning is a mechanical engineer for the Department of the Navy in Port Hueneme, CA.

Matthew Flynn is a medicinal chemist with Pfizer in Groton, CT.

Mohammad Golnaraghi, a PhD student at Cornell, is working as a research assistant in the theoretical and applied mechanics department.

Edmund Henry is employed as a project engineer at Stone & Webster, Boston.

Karlin Jessen serves as division chief for the U.S. Air Force at Hanscom AFB, MA.

Michael Lawrence is an engineer intern for the Connecticut Department of Transportation in New Milford.

Michael Maloney works as a systems engineer at Arinc Research Corp., North Billerica, MA.

Thomas Marnik has been appointed to the post of building commissioner in Fairhaven, MA. He holds a construction supervisor's license and is a town meeting member and a call fireman.

Mark Morawiec has completed his first year in the MBA program at Duke University, Durham, NC.

Martin Morra is a research assistant at MIT.

Thomas Neale now works as a senior assembly engineer with Zytrex Corporation in Sunnyvale, CA.

Lynne Ondek is in the advanced engineering program at Honeywell Information Systems, Billerica, MA.

Richard Petrucci works as a pipe support designer for Stone & Webster (Boston) in Waterford, CT.

Wilson Powell is an associate software engineer for Raytheon in Bedford, MA.

John Ravener is with Electric Boat, Groton, CT.

1983

MARRIED: Michael Brown and Elizabeth Calabro on June 9, 1984, in Waterbury, CT. Elizabeth graduated with a nursing degree from St. Joseph College in West Hartford and was formerly an RN at Waterbury Hospital Health Center. Michael, an electrical engineer with Hughes Aircraft, Canoga Park, CA, is studying for his master's degree at USC. . . . **Keith Comeford** and **Lorrie Hermanson, '84,**

recently in Clinton, CT. Lorrie is doing graduate work at Brandeis University. Keith is a software engineer at Digital Equipment Corp., Nashua, NH. . . . **David Dumas** to Penny Kramer on June 24, 1984, in North Kingstown, RI. Penny, a graduate of Becker, is an interior designer with Royal Business Group, Worcester, MA. David works for Data General in Southboro. . . . **Michael J. Gagnon** and Linda Corrado on May 12, 1984, in Cumberland, RI. Linda, a certified occupational therapist assistant, graduated from Becker. Michael is an assistant sales engineer with Westinghouse in Jericho, NY. . . . **Richard Scott** to Judith Stiles in Falmouth, ME, on June 30, 1984. She graduated from Becker. He works for UNC-Naval Products Division, Uncasville, CT.

Jane Norris Booth is a materials engineer at the Army Materiels and Mechanics Research Center in Watertown, MA.

Dennis Boyd serves as a technical service engineer at National Starch & Chemical, Bridgewater, NJ.

Guy Busa is now a graduate student at MIT.

Catherine Coyne works as a software engineer at Wang Laboratories in Lowell, MA.

David Crawford holds the post of manpower management officer for the U.S. Air Force at the Air Force Management Engineering Agency, Randolph AFB, TX.

Gerard Grippo works as a material supervisor at General Dynamics in Quincy, MA.

Joseph Iantosca Jr. is a project coordinator for Belair Construction in Weymouth, MA.

Brian Klaubert works for Kimberly-Clark Corp., New Milford, CT.

Kevin Manning is currently in Birmingham, England, serving as a consultant for the machinery division of E.M. Hart Corp.

David McFarlin serves as inventory coordinator at Nypro Inc., Clinton, MA.

Cheryl O'Neal is with DEC in Maynard, MA.

Joel Patenaude, who is with the Peace Corps in Kenya, is affiliated with the International Development Regional Office of Housing and Urban Development.

Mark Pease now works with a transmitter design group in the systems development division at the Westinghouse Defense and Electronic Center in Baltimore, MD.

John Pepper works as associate test engineer at Hamilton Standard, Windsor Locks, CT.

Eric Peterson is with Raytheon Co. in Portsmouth, RI.

James Petropulos is a civil engineer for Allan H. Swanson Inc., Nashua, NH.

Michael Russell works for Superior Electric in Bristol, CT.

Douglas Saunders is a marketing manager with Automated Assemblies Corp., Clinton, MA.

Peter Simeone is with the aircraft engine group at GE in Lynn, MA.

Charles Smith works for Production Services Corp., Cambridge, MA.

Stephen Smith is a components engineer for GE in Pittsfield, MA.

No longer with ITT, **Lynn St. Germain** is now a design engineer at Hamilton Standard, Windsor Locks, CT.

Ronald Thompson, Jr. was recently promoted from commercial loan analyst to cash management consultant at the United Bank of Denver, Denver, CO.

Cynthia Nault Torrey is now a software engineer for the Foxboro (MA) Company.

Bernadette Young is an associate engineer at New England Electric, Westboro, MA.

Ralph Rosen has received his MBA from Babson College.

Douglas Schelleng is a planner for Rockland County Planning Board in New York City.

Garrett Thompson is currently a senior engineer for Harris-Government Satellite Communications Division.

John Tirrell is employed as a design engineer by Stone & Webster in Shippingport, PA.

Scott Traynor works for the Naval Underwater Systems Center in New London, CT.

Robert Valentine continues as a component engineer at Data General in Westboro, MA.

Cynthia Widmer is an electronic engineer II at Sanders Associates in Nashua, NH.

Peter Young recently graduated from the Northern Essex Community College Evening Nursing Program in Haverhill, MA. One of his classmates was his mother, Ruth. They are thought to be the first mother and son team anywhere to complete a four-year nursing program together.

1984

MARRIED: Kimberly Cote and George Bursaw III on July 14, 1984, in Slatersville, RI. Kimberly is with the Raytheon Co., Wayland, MA. George, a graduate of Ponaganset High School and a staff sergeant in the Rhode Island Air National Guard, works for Alumiline Corp., Lincoln. . . . **Kenneth Messier** and Robin Tucker in Spencer, MA, on May 26, 1984. Robin graduated from Quabbin Regional High School. Kenneth works for Howmedica in Groton, CT.

William Abbott has joined General Electric.

Daniel Adner is now with General Spring & Wire Co.

Susan Ames works for Du Pont.

David Anderson is on the staff at Teradyne Inc.

William Andrews has been named a member of the staff at NBI.

Douglas Anneser works for Unitrode Integrated Circuit Corp.

Arpi Aprahamian has been employed by the Gillette Co.

Michael Atamian is a graduate student in chemistry at the University of California.

Dean Athans works for GE.

Desiree Awiszio works for Digital Equipment Corporation.

David Backer is on the staff at Sikorsky Aircraft.

Carol Bagdis has joined Polaroid Corporation.

Craig Baptiste is with Du Pont.

Terry Barber has joined Pfizer Inc.-Howmedica.

David Barlow is with the U.S. Army.

Kevin Barrett works for Data General.

James Barry has joined the Foxboro Company.

Steven Baturin is now with IBM.

David Beane has joined the Turner Corporation.

Thomas Beaulieu is with Data General.

Rudy Beaupre works for Combustion Engineering.

David Beck has accepted a post with Du Pont.

Maria Biascoechea Fernandez is currently with Nypro Co. in Puerto Rico.

John Bibinski works for the Gillette Co.

Sam Bigelow has accepted a post with IBM.

Earle Blatchford is with Alan H. Swanson Inc.

James Bock has joined Data General.

Michael Bonder is on the staff of Stratus Computer.

Denise Bolduc works for DEC.

David Boudreau is with the Raytheon Company.

Patrick Brady is employed by General Electric.

Robert Bragdon has joined the staff at Sanders Associates.

Jack Bravo is now with Data General.

Patricia Bray works for IBM.

John Breen works for General Electric.

School of Industrial Management

Guy Nichols, '56, retired as chairman of the board, president and chief executive of New England Electric Systems on July 1. He had been with the company 38 years, 14 as president. He will continue as director. Under Nichols's leadership (diversified holdings in coal, oil, hydropower and nuclear areas), the utility has lowered its prices to consumers and raised its return on equity. In 1983, he was named New Englander of the Year by the New England Council, a 1,200-member regional business association. In 1982, he received the Founders Award from the Energy Technology Conference, an annual forum for energy professionals. In 1980, he was elected to a three-year term on the Coal Industry Advisory Board, sponsored by the Paris-based International Energy Agency. He was one of eight U.S. representatives of major coal-related industries to serve on the board. Recently, he received an honorary doctoral degree during commencement exercises at Nichols College in Dudley, MA. He is a former Sloan Fellow from MIT, where he received his MBA.

Alden Jacobson, '66, coordinator of programs for the Vermont Agency of Development of Community Affairs since 1980, recently received awards from the state and from WPI for his contributions to machining and electronic training for Springfield area industries. Vermont Lt. Gov. Peter Smith and **Bill Julian, '49,** past president of the Alumni Association, participated in the presentation, which took place during ceremonies held for graduates of the Advanced Vermont Electronics Training Program. . . . **Lee Peterson, '75,** has been advanced to vice president of operations at the BTR Valve Group's member company, the Worcester Controls Corporation, West Boylston, MA. He is in charge of manufacturing, data processing and office services for company facilities in West Boylston, Olive Branch, MS, and Liberty, NC. Affiliated with the firm for 22 years, he has held a variety of posts, most recently that of vice president of finance and controller. . . . **William Poist, '77,** has been named president and chief operating officer of Commonwealth

Gas Co., Southboro, MA. He joined the company in 1971, and was promoted to executive vice president in 1978. He has a bachelor's degree in business and industrial management from Johns Hopkins University and an MBA in marketing from BU. Currently serving in various capacities with several national gas industry associations, he is vice chairman of the New England Gas Association. A director of the Shawmut Community Bank, he also is chairman of the local Boy Scout Council, as well as a trustee of both Central New England College and the Regional Family YMCA. In 1983, he received the Albert J. Schwieger Award from WPI's School of Industrial Management.

COMPLETED CAREERS

Eugene H. Powers, '12, died May 25, 1984, in Worcester Memorial Hospital. He was 93 and a native of Worcester.

Following his graduation as a civil engineer, he worked as a salesman for Adams & Powers Co., then was a science teacher in Worcester high schools from 1915 to 1922. From 1922 to 1931, he was vice president and assistant treasurer of Adams & Powers Co. He retired in 1960 after serving as a science and math teacher in Worcester high schools.

Active with the Masons, he was a former master of his local lodge, and he belonged to the Royal Arch chapter and the Worcester County Commandery, Knights Templar. He belonged to the Odd Fellows, was a founder of the Worcester North Chester Club and was a 70-year member and past president of the local chapter of the Sons of the American Revolution.

A member of the National Retired Teachers Association and the Retired State, County and Municipal Employees of Massachusetts, he also belonged to the Tech Old-Timers, the Worcester Historical Society and the Friends of Old Sturbridge Village. He was the father of **Foster C. Powers, '37.**

Clarence E. Fay, '17, of Lake Worth, FL, passed away of congenital heart failure on May 15, 1984. He was born April 7, 1894, in Framingham, MA, and graduated with a BSEE.

He retired in 1959, after being employed with Bell Telephone Co. of Pennsylvania since 1919. During his career with the firm, he was district engineer, district plant superintendent and division plant superintendent.

A life member of the Telephone Pioneers of America, he was also a member of the Presbyterian Church (elder) and the Masons. He was a former president of the Pittsburgh chapter of the Alumni Association.

Otho M. Fish, '17, died at his home in Chatham, NJ, on April 23, 1984, at the age of 92. He was born in Fitchburg, MA, and was an electrical engineering student at WPI.

Before retiring in 1958, Mr. Fish was an engineer for 20 years with Jackson & Moreland Engineers, an electrical transmission firm in Boston. He belonged to the Masons and to the High Nooners Club. He was a graduate of Pratt Institute, New York City.

Carl E. Skroder, '21, a professor emeritus at the University of Illinois, died at his home in Urbana, IL, on April 12, 1984, at the age of 85. He was born in Worcester on April 29, 1898, and graduated as an electrical engineer from WPI.

Prof. Skroder, who was a professor of electrical engineering at the University of Illinois for 41 years, retired in 1966 as professor emeritus. He had an MS from the university and had previously been employed by AT&T.

A member of the American Association of University Professors, he also belonged to the American Society for Engineering Education and Rotary International. He was a registered professional engineer in Illinois. His other memberships included SAE, Eta Kappa Nu and Tau Beta Pi. He attended the Methodist Church.

John D. Austin, '22, of Seneca, NY, passed away on May 24, 1984.

From 1919 until his retirement in 1966, the Kendall native owned and operated Austin Farms in Hall. In 1956, he and his son were the New York State corn production champions.

Mr. Austin belonged to the Ontario County Farm Extension Service and the Farm Bureau. He was a charter member of the Grange League Federation, which eventually became Agway. He belonged to the United Church of Christ, the American Legion, the Masons and the local fire company. He was an avid hunter and sportsman. During World War I, he served in the U.S. Army.

Robert M. Wilder, '22, a leading Southern California structural engineer, died April 2, 1984, in Eureka, CA. He was 83 and a native of Athol, MA.

After graduating from WPI with his BSCE, he was employed in Peru, Panama, the Bahamas, the West Indies, Cuba and Florida in construction and design. From 1934 to 1954, he was affiliated with Paul E. Jeffers, a structural engineer in Los Angeles. From 1954 to 1964, he was a structural engineer in private practice.

Mr. Wilder was a former executive of the structural engineers associations of California and Southern California. An early proponent of earthquake-proof building methods, he designed many California structures, including the racing plant for the Los Angeles Turf Club at Santa Anita Park in Arcadia, and the largest communications complex in the world, the Los Angeles Telephone Building and microwave tower.

Other earlier affiliations were with the Los Angeles Chamber of Commerce, American Arbitration Association and the Mineralogical Society of Southern California, which he had served as treasurer. He belonged to Lambda Chi Alpha.

Russell L. Norton, '23, of West Falmouth, MA, passed away on April 7, 1983. He was a native of Willimantic, CT, attended Brown University, and graduated from Boston University.

For 40 years, he worked for the New England Telephone & Telegraph Co. After retirement, he took enamel-on-copper art classes. He belonged to SAE and Skull.

William L. Reynolds, '24, died April 23, 1984, in Portland, ME, after a long illness. He was 81 years old.

He was born in Northampton, MA. For many years, he was a superintendent for Lovell Bus Lines, Maynard, MA. He retired in 1978 after 25 years with Hemingway Transportation Co. He belonged to the Odd Fellows.

Charles M. Moran, '26, a co-owner of the National Contracting Company, Fall River, MA, died May 9, 1984, at the Clifton Geriatric Center, Somerset, MA. He was born in Fall River on Sept. 13, 1905.

He graduated as a mechanical engineer from WPI. During his career, he was with Crompton & Knowles, Petroleum Reclamation Co. and Swiss Oil Co. Later, he became a partner in the National Roofing Co. and the National Contracting Co., as well as president of Webarm Diecasting. In 1959–60, the National Contracting Co. sandblasted and painted the dome of the U.S. Capitol building.

Mr. Moran spent more than 25 years upgrading the former Union-Truesdale Hospital (now known as Charlton Memorial Hospital) from a small, two-building facility to a viable health care complex, serving as hospital president, trustee and as chairman of the building committee. His fellow trustees paid tribute to him by naming the fourth new hospital building in his honor.

He had served 30 years as director of the former B.M.C. Durfee Trust Co. and as honorary director of its successor, the Durfee Attleboro Bank. Fifty years ago, he was commodore of the Fall River Yacht Club. He belonged to the ASME, SAE, Skull and the Poly Club, and he was a former vice president of the Rhode Island chapter of the Alumni Association.

Charles N. Ryan, '27, president and owner of the former Ryan Manufacturing Co., died in Ware, MA, on April 16, 1984, at the age of 80. He was a native of Ware. In 1969, he retired from Ryan Manufacturing.

Theodore J. Englund, '28, a longtime employee of Norton Co., died in Worcester on July 3, 1984, at the age of 78. He was born in Worcester and graduated with his BSME from WPI in 1928.

He was with Norton Co. for 45 years, serving as an industrial engineer, manager of industrial engineering and as a factory manager. He retired in 1969. For many years, he taught mathematics at Worcester Junior College. He attended Harvard Business School.

Ted was a 50-year member of the Mendelssohn Singers of the Trinity Lutheran Church. A past president of the Tech Old-Timers, he was

recently presented with its distinguished service award. He was secretary of the Class of 1928.

He served as a director of the Shrewsbury Historical Society and was a former director of the Worcester Crafts Center. He was a charter member and former council member of Trinity Lutheran Church. He belonged to Tau Beta Pi.

John E. Gill, '29, a retired executive with Buffalo Forge Company, died in Sharon, CT, on May 28, 1984, at the age of 77. He was born in Manchester, CT, and graduated as a mechanical engineer from WPI.

He joined Buffalo Forge, Buffalo, NY, in 1929, retiring in 1972 as manager of foreign licensees. During his career, he had also served as sales engineer and chief engineer of the firm. He was instrumental in designing fan equipment for the world's largest vehicular tunnel through Mt. Blanc, connecting Italy and France.

Mr. Gill belonged to ATO, the Poly Club and Skull. He was a former vice president of the Western New York chapter of the Alumni Association.

Richard W. Hanson, '30, passed away in Greenville, SC, on September 13, 1983. He was 74, a native of Biddeford, ME, and a member of the Class of 1930.

He was retired from the Platt Saco Lowell Corporation. In World War II, he served in the U.S. Army. He belonged to Sigma Phi Epsilon.

Arthur W. Backgren, '32, a retired opera singer, died in San Francisco on June 18, 1984, at the age of 73. He was born in Worcester and received his BSCE from WPI.

Following graduation, he entered the insurance field. He then joined the Massachusetts Water Supply Commission on construction of the Winsor Dam of Quabbin Reservoir. Other posts were with Quonset Point Naval Air Station in Rhode Island and the U.S. Engineers as office engineer on flood control and airport construction in Lowell and Bedford, MA.

For 20 years he sang in the chorus of the Metropolitan Opera in New York City, retiring in 1973. He had also sung with the New York City Opera Company, at St. Thomas Church on Fifth Avenue and in choral productions with Arturo Toscanini and the NBC Symphony Orchestra. Earlier, he had sung leading bass roles in the Gilbert and Sullivan operas produced by the Worcester County Light Opera Club.

Ernest M. Crowell, '34, a longtime research chemist in polymer chemistry, died at his home in Beverly, MA, on July 15, 1984, at the age of 71. Born in Marlboro, he received his degree in chemistry.

During his career, he was with the Douthart Co., E.F. Drew & Co. and MIT. For more than 35 years, he worked for USM Corporation (Emhart) in Beverly, MA, where he served as a research and development chemist in the machinery division. His primary concern was with organic adhesives for use in shoe assembly. He retired in 1973.

Mr. Crowell belonged to the American Chemical Society, the Society of Rheology, the American Association for the Advancement of Science, the Quarter Century Club and the Congregational Church. He was the father of **Douglas Crowell, '66.**

B. Gustaf Larson, '34, a retired superintendent of maintenance for New England Power Co., died in Fairlawn Hospital, Worcester, on June 18, 1984, at the age of 71. He was born in Worcester and graduated with a BSEE from WPI.

In 1973, he retired from New England Power after having served the company for 38 years. Among his posts with the firm were meter superintendent, technical assistant and superintendent of maintenance. He had also served as staff assistant.

Mr. Larson, a registered professional engineer, was also a 32nd-degree Mason and a past monarch and life member of Aletheia Grotto. He belonged to the Scottish Rite Bodies and the Shrine. Other memberships were with Lambda Chi Alpha, the Tech Old-Timers, the Poly Club and the Baptist Church.

Donald C. MacKenzie, '34, of Brewster, MA, died at Cape Cod Hospital on April 21, 1984. He was 72 and a native of Lowell.

After attending WPI, he owned and operated a wholesale grocery business. In 1950, he moved to Cape Cod, where he was a self-employed cabinetmaker, specializing in antique reproduction furniture. He operated a shop called The Pine Tree Shilling.

Clare W. Harris, '38, of Carpinteria, CA, retired project engineer from Rockwell International, passed away on May 14, 1984, following a long illness. A native of Bangor, ME, he was born on Oct. 28, 1915.

Following graduation as a mechanical engineer, he was employed by Wright Aero Corp., Republic Aviation Corp., Curtiss-Wright, M.W. Kellogg Co. and Rocketdyne. He belonged to Tau Beta Pi and the American Rocket Society. He was an associate fellow of the AIAA.

Robert J. Hamilton, '39, of Bridgton, ME, passed away in Florida on March 25, 1984, after a short illness. He was born in Madison, ME, on July 15, 1915. He received his BS from the University of Maine at Orono.

At one time, he was manager of fleet sales for Mobil Oil Corp., New York City. He belonged to Phi Gamma Delta.

Gerald Lainer, '40, was stricken and died at his home in Manhassett, NY, on April 1, 1984. A Worcester native, he was born on August 21, 1918. He was a graduate electrical engineer.

Mr. Lainer, a member of AEPi, was in the electronic-equipment exporting business in Manhassett.

Harold A. Gibbons, '49, died in Fort Pierce (FL) Medical Center on April 25, 1984. He was born in Southampton, MA, on Feb. 14, 1917. He received his BSEE from WPI.

For many years, he was with Westinghouse Electric Co. in Springfield, MA, and in Albany, NY. He retired and moved to Florida in 1977.

Edward W. Eidt, Sr., '53 SIM, of Bushnell, FL, passed away on April 3, 1984. He was born in Worcester on December 16, 1908.

During his career, he was a trooper with the Massachusetts State Police, personnel manager for Wyman Gordon, Worcester, foreman for Bay State Abrasives, industrial relations manager for Reed Prentice Corp. and commissioner for the Federal Mediation Service in Albany, NY. In 1955, he was elected chairman of the Worcester Rent Control Board.

He was the father of **Edward Eidt, Jr., '57,** and **William Eidt, '65.**

David F. Johnson, '58 SIM, a retired comptroller for Woodbury Co., passed away on May 30, 1984, in Worcester Memorial Hospital. He was born in Worcester on June 25, 1916.

A graduate of Northeastern University, for many years he was a comptroller at Woodbury Co., retiring in 1979. During World War II, he served as a chief warrant officer in the Army. He was a lector at Immaculate Conception Church, and he was a member of the Worcester Civitan Club, the National Cost Accountants Association and the Green Mountain Club.

Walter Zakrzewski, '60 MNS, died in Worcester on April 5, 1984, after a long illness. He was 52.

For 17 years, he was a science professor at Quinsigamond Community College. Formerly, he had taught chemistry, physics and general science at Plainfield (CT) High School. He then taught and was chairman of the science department at Leominster High School. Later, he taught chemistry at Auburn High School and chemistry and biology at Grafton High School.

He graduated from Worcester Junior College in 1952. In 1954, he received his BS in biology and chemistry from Clark. In 1958 he was the recipient of a National Science Foundation scholarship to pursue advanced training in science.

Mr. Zakrzewski belonged to the Massachusetts Teachers Association, the National Education Association, the American Association of Physics Teachers, the New England Mathematical Association of Two-Year Colleges, the American Mathematics Association of Two-Year Colleges and Our Lady of Czestochowa Church.

Laurence Michaels, '75, of Ringwood, NJ, died in January of 1983, following a long illness. He was born in Far Rockaway, NY, on Sept. 10, 1949. In 1975, he graduated with his BS in computer science from WPI.

During his career, he had served as a systems programmer with Whitlow Computer Systems in Englewood Cliffs, NJ, and as a self-employed computer consultant with Michaels Enterprise, Plainsboro.

Anthony Sinkewich, '79 SIM, became ill while on a business trip in Seoul, South Korea, and died May 25, 1984. He was 72 and a native of Barre, MA.

He was a graduate of WPI's School of Industrial Management and was also a member of the Class of 1967. In 1980, he retired after working as a heat treating specialist at Massachusetts Steel Treating Division of GKN Powdermet Inc. in Worcester. Since 1981, he had been a consultant with Small & Medium Industry Promotion Corp., also in Worcester.

Mr. Sinkewich had an associate's degree in engineering from Northeastern University. He was a founding member of St. Columba's Church, Paxton, and belonged to the former Sons of Paxton. He was a life member of the ASM and a member of the American Association of Retired Persons.

"of the waters of the Earth"
continued from page 33

mixed: "It really separated the social from the math types" he says. In most college programs, he adds, hydraulics professors teach hydrology as a subset of highway engineering courses. It was his efforts at Stanford that attempted to change that direction. Yet he admits that today his field may be drying up, because, in his mind, "Hydrology is a field that calls for experience, and finding Ph.D.s to head graduate hydrology programs is becoming next to impossible." Plus, he says, "The computer seems to be eliminating the need for so many warm bodies."

During his tenure at Stanford, Linsley also served in the federal Office of Science and Technology, was a member of the U.S. National Water Commission, and was president and chairman of Hydrocomp Inc., Palo Alto, CA. Earlier in his career, he was a Fulbright Professor at Imperial College, London. A member of the National Academy of Engineering, he has won several prestigious ASCE and other awards.

In 1973, he received an honorary doctoral degree from the University of the Pacific. And in 1979, WPI awarded him an honorary doctorate in engineering, to climax his exemplary career.

Linsley retired from academics in 1975, leaving Palo Alto ("Too much smog in the Valley," he says) to head Linsley, Kraeger Assoc. In the pristine air of Santa Cruz, on the northern rim of Monterey Bay ("But too much water traffic for my sailing style"), he and wife Ann are "comfortably inaccessible" to the hectic demands of academe.

He's been called the country's paramount hydrologist in the heyday of the profession. Yet Ray Linsley has always preferred the outdoors to things like the cocktail party circuit, the solitude of hiking to the buzz of the city, the satisfaction of guiding Boy Scouts to the frenzy of public life. You can almost hear the gurgling of the stream, the hush of the breeze and the song of unseen birds in the oversized mural that dominates his firm's offices.

"Executive" was the type of work indicated in his 1937 career placement records from WPI. By any measure, Ray Linsley's teaching, research and writing, his quiet style, leadership and intense commitment to the best management of our most precious resource, have melded to become a classic fulfillment of that prophetic observation of almost 50 years ago.

FEEDBACK

Michael Carroll

Editor:
A few comments on your article about Higgins House [August 1984]:

Much of the structural lumber for the house came from about 20 old New England barns purchased by Aldus Higgins, '93, and carefully disassembled.

The roof is unique. It is made of clay tiles which simulate cedar "shakes" in an amazingly realistic way. Milton Higgins has told me that the roof installed originally did not suit Aldus Higgins, who had it removed and replaced by the present roof. These special clay tiles, I understand, were developed solely for this application.

The article says little of the professional achievements of the Higgins family, such as the fact that both Milton and Aldus Higgins became president and CEO of the Norton Company and served as trustees of WPI (as did Milton's grandson, Milton P. Higgins).

Aldus Higgins gave the land for the First Baptist Church at the corner of Park Avenue and Salisbury Street from part of his estate. But in the deed he stipulated that no bells be rung at the church.

Dr. Ray E. Bolz, Vice President and
Dean of the Faculty Emeritus

Editor's note: For a complete history of the Higgins family and their relationship with WPI and the Worcester community, the reader may wish to refer to Two Towers: The Story of Worcester Tech, *by Mildred McClary Tyneson.*

Editor:
Your article "Unraveling Rainbows" [August 1984] was very interesting. It covered virtually every rainbow myth and theory throughout history, but failed to consider the most ancient of books.

The Bible account found in the ninth chapter of Genesis is quite interesting. It shows how the rainbow serves as a sign by God that he will never destroy the Earth by flood again. The rainbow thus serves a useful purpose. It creates an atmosphere of tranquility after a storm.

Richard Fisher

Robert S. Arnold

WASHBURN:
THE TRADITION RESTORED

Find out what's new—and what remains the same—in WPI's second-oldest and now most modern learning facility. Coverage of the renovation, expansion and rededication of Washburn Shops and Laboratories begins in this issue and continues in the February 1985 issue of the *Journal*.

WPI Journal

WORCESTER POLYTECHNIC INSTITUTE FEBRUARY 1985

Washburn: The Tradition Restored

Shakespeare and the Engineer

Dr. Edmund T. Cranch at rededication ceremonies of the Washburn Shops and Laboratories.

A Message from the President

The attention given in this issue of the WPI *Journal* to pre-college education, and to our high schools in particular, is of paramount importance to science and engineering education at the college level. Because the United States has no national system of education, we often lose sight of the critical role pre-college education plays in providing the proper base to the pyramid within which science and engineering education is contained. I describe the dependence in this manner, because both the demographics and the curricular substance of science and engineering education are strongly related to a sequential process that can be thought of in geometric terms. The sequential nature of the process also implies a time dimension for effecting change.

Consider first the nation's impending demographic shifts and their consequences for science and engineering. The projection for high school graduates indicates a 22 percent decrease nationwide between 1982 and 1991. All but ten states share in the decrease, which in absolute numbers is a decline of approximately 590,000 from a base of 2.2 million high school graduates. This drop varies widely by region and state, with several New England and Middle Atlantic states showing about a 40 percent decline.

The ramifications for science and engineering education are far-reaching. Half of all bachelor of science degrees in engineering nationally now come from 45 colleges that have 400 or more graduates each year. Fourteen of these institutions are in states (New York, Pennsylvania and Massachusetts) where the high school population will be especially hard hit. Twenty-seven of the 45 colleges are concentrated in the 13 frost-belt states, which will all experience an appreciable decline in their high school populations. Clearly, if the flow of science and engineering graduates is to be maintained in the face of these major demographic shifts, substantial efforts will be required to increase the number of high school students who are both qualified and motivated to pursue these fields. The critical importance of our high schools is obvious.

The sequential nature of the process is again reflected by the need for curricular strength in high school science and mathematics programs, which form the foundation for science and engineering education. Unfortunately, these are the very subjects in which our schools are most vulnerable. Between 1978 and 1984, at least 20 comprehensive studies of the nation's school systems cited major deficiencies: loss of basic purpose, absence of clearly identified goals, low expectations of students, and inadequate teacher preparation. Anyone who reads these studies is struck by their fundamental unanimity on the key issues and must conclude beyond any doubt that our nation is dangerously at risk in several ways.

U.S. technological supremacy erodes as other nations strengthen their own capacities. Our ability to compete economically is challenged, and our strategic position is under constant pressure, due in part to a shortage of excellent engineers and scientists and a lack of scientific and mathematical literacy. Such literacy is essential if our citizens are to support a technologically based society.

In the past 20 years the percentage of high school students completing courses in science and mathematics declined in biology, general science, geometry and algebra. This loss of interest is significant when we realize that Japan and the Soviet Union recognize that world leadership depends on technological superiority. It has been observed that the technological battle with the Japanese is really an industrial equivalent of the East-West arms race.

Students' disinterest in pre-college science courses is acquired early: Nearly half of them dislike science by the end of the third grade; the figure jumps to nearly 80 percent by the eighth grade. The popularity of mathematics declines from a high of 48 percent in grade 3 to a low of 18 percent in grade 12. Another study traces the loss of talent from the nation's 4.2 million high school freshmen in 1977–78: Only about 300,000 of these students (7.3 percent) entered the study of science and engineering as college freshmen in 1981–82; 83,000, or 2 percent of the original high school class, will graduate, 0.4 percent will earn a master of science degree and 0.1 percent a doctorate in science and engineering. The paucity of doctorates is directly related to the serious shortage of faculty in several engineering disciplines. This loss of interest and talent is a national tragedy and clearly affects our pool of scientists and engineers.

To meet this critical situation, the nation's school systems must embark on an urgent program to revitalize mathematics, science and technology education in pre-college curricula. We will need to establish regional "lighthouse" schools in which these subjects are given high priority so that they can serve as beacons to which other schools can look for guidance. The task can only be accomplished in a realistic time-frame if our science and engineering colleges—together with our professional societies, industry and government—*actively* support the required effort. Priorities will need to be changed and additional sources of talent and funds directed at this effort.

Edmund T. Cranch

Edmund T. Cranch
President

WPI Journal

WORCESTER POLYTECHNIC INSTITUTE

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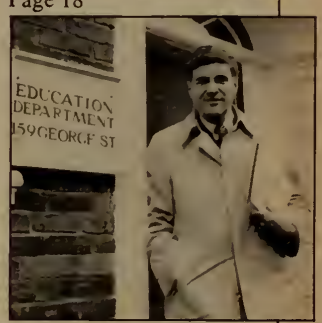

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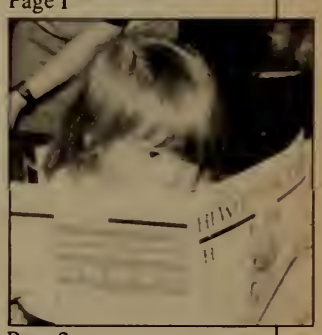
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Cover: The Washburn Shops and Laboratories, restored. Photograph by Robert Arnold.

NEWS FROM THE HILL

To ABET or not to ABET

In early November 1984, representatives of the Accreditation Board for Engineering and Technology (ABET) made a planned visit to WPI to review the curricula of the Departments of Chemical, Civil, Electrical and Mechanical Engineering, which ABET accredits. In a 1981 visit, ABET granted these departments three-year accreditation but also recommended reinforcing the science component of the programs for engineering students. Subsequently, these departments complied with the ABET recommendation and established distribution, or degree, requirements to take effect with freshman entering WPI in September 1984.

In keeping with its policies, ABET visited WPI in November to review the actions it had recommended in 1981. According to Vice President and Dean of the Faculty Richard H. Gallagher, WPI will receive a written evaluation of ABET's November visit in April 1985 and will have four weeks to respond. Later, in June or July 1985, the four departments will receive word of ABET's accreditation decision.

"ABET accreditation," says William R. Grogan '46, Dean of Undergraduate Studies, "is the single most important endorsement of the academic qualifications of any college's engineering programs." "Without ABET accreditation," he adds, "WPI's engineering disciplines may face serious problems of credibility—before prospective students and employers alike."

According to Grogan, during an exit interview at its November visit, ABET suggested broadening the coverage of distribution requirements still further. It also recommended review of WPI's faculty advising system. Active, well-informed advisors, the ABET panel said, are vital to any program which allows students freedom in selecting courses. Such academic freedom is a hallmark of the WPI Plan. Debate over how best to meet ABET expectations while preserving flexibility has been active, and at times, heated among faculty, administration and students for the past three years or more.

Along other guidelines, says Gallagher, ABET was quite positive in its review of WPI's engineering programs, including such elements as laboratory equipment, faculty and student quality and institutional support.

'Tis the season—for seniors to line up for job interviews. At the Office of Graduate and Career Plans, business is hot and heavy.

Presidential Search Update

As reported in the November 1984 *Journal,* Dr. Edmund T. Cranch has resigned the presidency of WPI, effective June 30, 1985. After seven years at the helm, he will become president of Wang Institute of Graduate Studies, Tyngsboro, MA.

Irving James Donahue, Jr. '44, vice chairman of the WPI Board of Trustees, has announced formation of a presidential search committee. He will chair this committee, which consists of trustees, faculty, alumni, staff and one student.

According to Dr. Ray E. Bolz, secretary to the committee and Vice President and Dean of the Faculty Emeritus, the committee hopes to make its recommendation to the Board of Trustees sometime this spring. In addition, as we went to press, the committee was considering use of an executive search firm as a complement to the committee's efforts. Such involvement, says Bolz, would be used only to identify appropriate candidates rather than also to contribute to candidates' evaluations or the committee's recommendation to the Board.

The closing date for applications for the presidency was January 25, 1985.

Paul Bayliss '60 to Preside Over Alumni Association

For the 1985–86 academic year, Paul W. Bayliss '60, of Barrington, Illinois, will serve as president of the WPI Alumni Association, according to Stephen J. Hebert '66, Director of Development and Alumni Affairs. Bayliss will succeed Harry W. Tenny, Jr. '56.

Bayliss has been active in alumni activities for many years, serving as senior vice president of the Association, 1984–85, and for several years as chairman of the Alumni Trustee Search Committee, which nominates WPI graduates for term positions on the Board of Trustees.

In other appointments, Alex C. Papianou '57 will succeed Bayliss as senior vice president. New members of the Alumni Fund board, effective August 20, 1984, are Michael A. DiPierro '68, Bruce A. MacPhetres '60 and Stanley P. Negus, Jr. '54.

Yours for a Song

Your years at WPI may have found you singing in the Glee Club, the Technicords, the Polytones, your fraternity octet, or even in the shower. If so, you like to sing and can (maybe) carry a tune and even harmonize a bit. If you still enjoy crooning, can sight read or learn a part quickly, and would like to bring back those old favorites, have I got a deal for you!

For a few months now, a small group of us grads have been getting together to rehearse the oldies we all remember—for the fun of it and maybe to sing at Reunion or Homecoming or other campus events.

The tunes have harmonies we can handle, and we rehearse on campus for convenience. So if you enjoy singing and think you'd enjoy the company of kindred spirits, why not plan to join us. Give me a call, and I'll give you the details.

Alex Papianou '57
(617) 543-5935

Editor's Note

A few days before mailing of the November 1984 issue of the *Journal,* Lawrence C. Neale '40 passed away. He was director of Alden Research Laboratory (ARL) from 1968 until 1975. We regret that publishing deadlines prevented us from noting his death in the November issue, which contained a feature story on ARL. His obituary appears on page 56 of this issue of the *Journal.* Our condolences to his family and friends.

Roger Perry '45

Unseasonably warm fall and early winter weather enabled easier construction of WPI's new residence center at the corner of Institute Road and Boynton Street. The new facility, to house and feed 229 students, should be open for September 1985 classes.

Mr. Washburn Would Approve

He never lived to see his dream open its doors to hopeful young industrialists like himself. Still, after 116 years, Ichabod Washburn would admire the facelifting his Washburn Shops recently received.

If Ichabod Washburn were able to view his Shops today, he'd have little trouble locating the building from the outside, for its facade remains essentially unchanged. But inside there's a whole new world, with the latest technology, faculty space and more. Where once stood his shops, its banks of lathes linked by leather belts to steam-powered shafts, he'd see a computer-controlled machine tool cutting intricate shapes from instructions programmed by a student operator.

Where students once worked at rows of blacksmiths' forges heating iron to white-hot plasticity, he'd see today robots programmed to perform in accurate repetition the most dangerous and tedious jobs of industry.

On the second floor where stood his beloved woodworking shop, he'd find the Department of Management. He'd see students seated not at ruled ledgers but in front of computer terminals, learning how to process, store and retrieve the information needed to make management decisions in moments.

In his day, Ichabod Washburn was one of Worcester's most successful businessmen. He was an inventor and an innovator. He had built the world's largest wire mill because he had applied new ideas effectively.

If he could see these renovated and enlarged Shops which bear his name, he'd be the first to recognize that after 116 years, the educational concept on which the Shops was built remains alive and well within its walls.

And Mr. Washburn would approve.

Michael Carroll

Milton P. Higgins and Philip Morgan officially open the Shops, as Dr. Edmund T. Cranch looks on.

For years, the Washburn Shops has stood as testament to Ichabod Washburn's sagacious vision of a school for teaching modern factory techniques. Yet time cannot help but take its toll on both the physical condition of the building and the facilities within.

When the Shops opened in 1869, students were greeted with what was by the standards of the day an ultramodern manufacturing facility. Besides the new machinery, there was a staff of experienced craftsmen under the watchful eye of Milton Prince Higgins, the Shops' first superintendent.

In accordance with the founding concept, the Washburn Shops created an environment that simulated the manufacturing floor of the day, providing students hands-on practice in advanced production methods to complement the "book learning" of their classroom courses. Too, the Shops produced manufactured goods for sale: lathes, drill presses, grinding machinery, laboratory equipment and even hydraulic elevators, which had been designed by Mr. Higgins right there in the Washburn Shops.

But perhaps the Shops' best-known product was the Washburn Drawing Stand, a tilting, wooden drawing table mounted on a three-legged cast iron base. For more than 80 years the Shops shipped them to corporate drafting rooms and schools throughout the country. WPI still receives an occasional letter inquiring about replacement parts. On the campus itself, these stands remain a common sight in classrooms where they serve as lecterns, prized relics of an earlier era.

The boom years of the Washburn Shops as a commercial activity came at the end of the 19th century. On the WPI Board of Trustees, however, there were some who began to feel that a commercial enterprise, prosperous as it might be, was an inappropriate adjunct to an institution of higher learning. They were a minority, but a vocal one. "The educational features of the Shops," they were saying,

"are getting lost in its profit-making incentives."

It took nearly 50 years to phase out the commercial shops, beginning with sale of the elevator business in 1896. Yet even today, industry-sponsored research in Washburn's Manufacturing Engineering Applications Center (MEAC), the Materials Processing Laboratory and other facilities continues the Shops' tradition of close ties with industry.

The issue of the Shops came to a head early in the tenure of WPI's third president, Dr. Thomas C. Mendenhall, who served from 1894 to 1901. The new president faced up squarely to the controversy. (See "Mendenhall" on page 12.)

The $4 million renovation, expansion and re-equipping of Washburn have revitalized WPI's second oldest building and have created under one roof a modern yet practical environment for continuing and broadening WPI's original Two Towers tradition. The reborn Washburn now houses:

- Modern manufacturing and materials processing laboratories stocked with state-of-the-art equipment, including computer-aided manufacturing, computer graphics, multiple testing systems, injection molders and automated manufacturing equipment.
- Eight identical "machining modules," equipped with lathe and milling machine—the heart of any machining operation—plus a video-cassette system for on-screen, individualized instruction. A specialized equipment area and group demonstration room, also with a video system, are just steps away from each module.
- MEAC, an industry-college program that applies robotic technology to current manufacturing production problems.
- The Department of Management and Management Engineering (including the faculty in Industrial and Operations Engineering), which recently developed an MBA program designed specifically for managers of technological organizations.

According to the architects, Goody, Clancy & Associates Inc. of Boston, improvements to the complex cover some 46,000 square feet in all—more than an acre—and include two new floors of space above the former welding shop.

What's more, the Washburn Shops is the nation's oldest building for the teaching of engineering (Boynton Hall now houses administrative offices). The Shops is listed in the National Register of Historical Places and has been named by the American Society for Metals a National Historical Landmark.

It truly was a celebration, bringing to a new—yet an old—facility a blend of perspectives on the past, present and future of WPI, and on higher education's role in what is being called the high-technology revolution. It was an opportunity to thank the many individuals and organizations that made the Washburn restoration a reality. And it was a chance for WPI's friends and neighbors to sample one of WPI's most advanced facilities for educating tomorrow's engineers.

It was "Washburn: The Tradition Restored"—the formal rededication of the Washburn Shops, October 19-20, 1984.

Dr. Thomas C. Mendenhall II, the grandson and namesake of WPI's third president, delivered the keynote address. "Grandfather's Views on Science, Engineering and Management" was a wide-ranging journey through a watershed period in the evolution of the Washburn Shops (see excerpts from his address, page 12), punctuated in words and emotion with the kind of frank humor that is a Mendenhall trademark.

Later, Professor of Management Arthur Gerstenfeld was moderator as four movers and shakers of high technology gave their views on the challenges confronting higher education in helping to build industrial America. The four executives—Martin A. Allen, Chairman, Computervision Corp., and a WPI Trustee; Fred W. Garry, Vice President, Corporate Engineering and Manufacturing, General Electric Co.; John A. Weese, Director, Division of Mechanical Engineering and Applied Mechanics, Natural Science Foundation; and Russell G. Meyerand, Jr., Vice President (Technology), United Technologies Corp.—shared their perspectives on this crucial issue, enlightening and impressing the enthusiastic audience.

Informal tours of the restored Washburn and dedication of the Arthur E. Smith '33 Materials Testing Laboratory followed. Though Mr. Smith, a retired chairman of United Technologies Corporation, was unable to attend the ceremonies because of illness, his wife, Frances, and son Kenneth joined Dr. Meyerand and the WPI community in honoring one of WPI's most distinguished graduates.

Later that evening trustees and guests of the college gathered for dinner in Alden Hall. The evening provided an opportunity for informal exchange after a long day of scheduled events and marked the conclusion of the three-year-long Capital Program, which was capped by the Washburn project. The high point of the evening

Worcester County Free Institute of Industrial Science, opened in 1868.

Ichabod Washburn, 1798–1868.

came in light and sound, in a specially commissioned slide show of the history of the Washburn Shops. It was a perfect nightcap to an extraordinary day and set the stage for the events of the following morning.

Saturday, October 20, couldn't have been more lovely: an idyllic autumn day in central New England. Hundreds from the public toured the Shops, entertained and delighted by what they saw: spanking clean machining modules, industrial robots executing intricate maneuvers, laboratories displaying latest generation equipment, the history and tradition of the Two Towers.

At the dedication of the Shops' Milton Prince Higgins Lecture Hall, President Edmund T. Cranch noted in his remarks what a challenge and a joy it has been to work with life trustee Higgins. "The questions he asks," said Cranch, "are always right on target. He is a president's trustee, the best of his kind." The break in Dr. Cranch's voice was evident even at the back of the hall. Yet few in the audience knew at that point that the Washburn project would be one of Dr. Cranch's last major programs as president: Earlier that morning, he had announced his resignation to the trustees, effective June 30, 1985.

Finally, the ribbon was cut at the Shops' new entrance on Freeman Plaza. Fittingly, Peter Morgan and Milton Higgins did the honors, assisted by President Cranch. It was Charles Morgan who had seen construction of the Shops through to completion for the ailing Ichabod Washburn. And it was the elder Milton Higgins, two generations before, who had charted the course of the Shops as its first superintendent. The modern-day Milton Higgins, his eyes perhaps dimmed by the years, yet his mind ever so sharp, and Philip Morgan, Charles Morgan's great grandson, together launched the Shops on a new course for the future.

Michael Carroll

Michael Carroll

Washburn symposium panelist Fred W. Garry (top left) of General Electric Company: "The continuing education of engineers is absolutely essential." Dr. Russell G. Meyerand, Jr. (left) of United Technologies Corporation: "It is terribly important that engineering education emphasize fundamentals." Raymond J. Forkey '40 (below, right), Capital Program Chairman, receives a pewter replica of the Washburn tower from Dr. Edmund T. Cranch at the trustees' dinner in Alden Hall.

Michael Carroll

Fuller, General Electric, Higgins, Lufkin, Morgan, Norton, Perreault, Smith, United States Steel, United Technologies: these names head a list of WPI benefactors that have helped greatly in giving new life to the Washburn Shops; people and organizations without whose generosity the Washburn program would not have been possible.

The George F. and Sybil H. Fuller Foundation

In 1887, at the age of 18, the late George Fuller began what was to become a lifelong affiliation with Wyman-Gordon Company. He started as the fledgling firm's bookkeeper, a skill he taught himself in a month—*after* he had convinced Winfield Wyman '82 and Lyman Gordon '81 of his worthiness. He also learned what he could about the heart of Wyman-Gordon: the newly evolving business of drop forging (now called closed die forging).

Several years later, in a moment of crisis for the young company, Fuller found a way to strengthen metal through heat treating to prevent brittleness in forged industrial parts. This hard-won success proved to be a turning point both for the young company and for George Fuller. He would go on to lead W-G for 48 of his 76 years with the firm.

He never graduated from high school, having to support his family after his father died. Yet in 1944, WPI awarded George Fuller an honorary doctorate in engineering. He also served on the WPI Board of Trustees from 1920 until 1939 and again from 1948–58. In addition to its support of the Washburn construction, the Fuller Foundation made a generous grant for the renovation of Kaven Hall during the Capital Program of 1979–83. WPI's Fuller Residence for students was named in Mr. Fuller's honor.

General Electric Company

A gift of significant proportions from GE, made in connection with the Washburn Shops' restoration, will be used to develop senior-year and graduate level courses and laboratories in topics closely identified with manufacturing engineering. Students and programs in computer aided design and manufacturing (CAD/CAM) automation controls, industrial automation, fracture mechanics, and ceramics will benefit directly from the GE grant.

General Electric has a tradition of supporting engineering and science education. The help of GE, one of the nation's oldest companies, will enable WPI to

The Names Behind the Washburn Story

accelerate the development of engineering courses and laboratories in the new Washburn Shops and elsewhere on campus.

Milton Prince Higgins and Norton Company

Milton Higgins' WPI heritage goes back to the beginning of the Institute, when his grandfather, for whom he was named, was appointed to the first faculty as superintendent of the Washburn Shops.

His father, Aldus C. Higgins, was graduated in the Class of 1893, served as president of the WPI Alumni Association and was a trustee for nearly 50 years. It was Aldus Higgins who built and later donated to the college the magnificent residence known today simply as the Higgins House.

Milton Higgins was president of Norton Company (of which his grandfather and Professor George I. Alden had been founders) when he joined the WPI Board in 1955, becoming the third generation of his family to serve in these two roles.

Milton Higgins served as chairman of the WPI Centennial Fund, which surpassed its goal of $15 million in support of campus capital needs in the 1960s. He also served as trustee chairman from 1971 to 1978, during implementation of the WPI Plan, a bold departure from traditional engineering education. For WPI, this was a period of unprecedented growth in student enrollment, faculty hiring, research and alumni giving. Yet, throughout these years, WPI operated with a balanced budget during every year except one.

At the Washburn Shops rededication, WPI named a new 110-seat lecture hall in honor of Milton Prince Higgins. He and Norton Company, which celebrates its centennial this year, have been among the Institute's most devoted advocates for many years. Norton Company, the world's leading maker of abrasives and grinding wheels, and industrial ceramics and drills, has played a vital role in many WPI programs. It was a charter member of the Management of Advanced Automation Technology (MAAT) Center, is a member of MEAC and houses a WPI Project Center. Scores of its employees are also active in the college's School of Industrial Management (SIM) and continuing education programs.

For three decades, Milton Higgins has helped guide WPI through by far its most dramatic era of growth and expansion. He has brought the name Higgins full circle in the history of WPI and the Washburn Shops. And his service to the college will not soon be forgotten.

Michael Carroll

Name day: From left, Mr. and Mrs. Milton P. Higgins, Dr. Edmund T. Cranch and Norton Company President Donald Melville at dedication of the Washburn lecture hall named in honor of Mr. Higgins.

The Morgan Family

Morgan Construction Company, an important benefactor of the Washburn restoration, has been closely identified with the wire industry as well as with WPI since the company's founding in the late 19th century by Charles H. Morgan. He was the great-grandfather of Paul S. Morgan, the firm's current chairman and president.

In 1866, at the suggestion of Ichabod Washburn, Charles Morgan was given the responsibility of erecting, equipping and overseeing the Washburn Shops as well as planning for its continuance. He was also elected a trustee of the college. Since Washburn died shortly before the Shops' completion, it was thus left to Morgan to bring to life Washburn's dream of a modern factory setting for teaching young men their life trades.

In 1888, Morgan formed a company to design and build wire drawing machinery for his own Morgan Spring Co. and other wire makers. Meanwhile, his son, Paul B. Morgan, Class of 1890, was being groomed to take over Morgan Construction for his aging father in an era of stiffening competition. The legacy did not end here. Philip M. Morgan, son of Paul B. Morgan, also became president of the company, as has his son, Paul S. Morgan. In a similar vein, these four Morgans have served on the WPI Board of Trustees. Most recently, Paul S. Morgan retired as chairman in January 1984.

Built in 1958, the Morgan Hall student residence was named in honor of the family which has served through four generations of trusteeship in continuous leadership of the Institute.

Raymond J. Perreault '38

Ray Perreault is one of three brothers who were graduated from WPI in the 1930s. A Worcester native, he earned his bachelor's degree in mechanical engineering and has enjoyed a rewarding career in the metalworking industry. Still, for all his success, he has never forgotten the education he received at WPI.

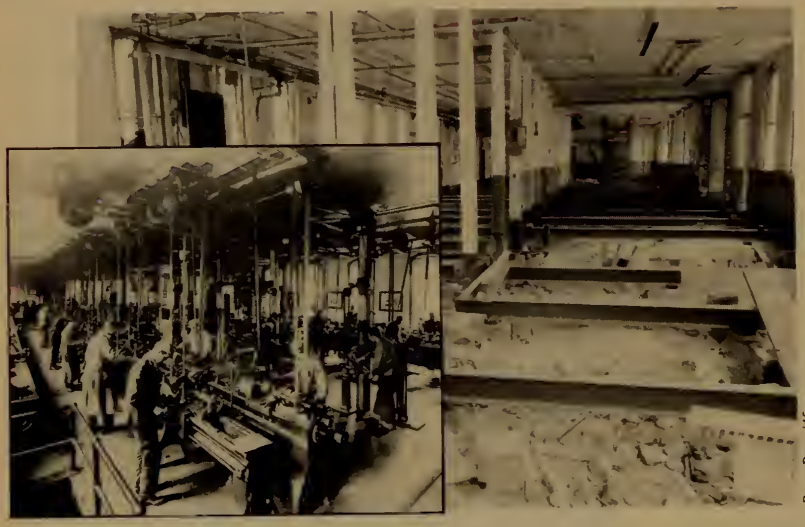
It is, perhaps, his gratitude for this education as well as his commitment to the mission of the college, that have caused him to establish a scholarship fund and to contribute to the refurbishing of the Alumni Office in Boynton Hall.

Recently he has also seen fit to provide in a major way for the renovation and expansion of the Washburn Shops, supporting construction of the main machining shop and a Washburn machining module. The college is indeed grateful for the sustained generosity of Ray Perreault and

Painters putting final touches on the Shops' bell tower (right), before placement of the regilded arm-and-hammer weathervane. Clockwise from far right: the Shops' new main entrance, which opens onto Freeman Plaza; the Management Department's suite of offices on the Shops' second floor; from the outside, the renovated Shops appears little changed; construction on the Shops' west end, once the site of welding shops, now home of MEAC; where a spaghetti-like network of leather belts once connected machining tools to steam engines (insert), construction makes way for modern industrial equipment and methods.

William Denison

Kenneth McDonnell



Roger Perry '45

Michael Carroll

Kenneth McDonnell

Robert Arnold

other alumni and friends like him.

Today, Perreault is President and Treasurer of Falls Machine Screw Company Inc., of Chicopee, Massachusetts. He has been with the company for 45 of its 46 years. He also serves as a WPI trustee.

Arthur E. Smith '33

Prior to his retirement in 1973, Arthur E. Smith was one of Pratt & Whitney Aircraft's key movers. It was Smith who served as chief engineer of P&W's 25,000-employee Kansas City, MO, facility from 1942 to 1944, during the height of the war effort. He was only 31 when he took on that responsibility. He later rose through the ranks to become president of United Aircraft (now United Technologies) Corporation in 1968 and was named its chairman in 1972.

Arthur Smith was one of the early members of Professor Kenneth Merriam's Aero Elective Program for top students in mechanical engineering. As these young men studied the design of engines, probed the mysteries of flight and speculated on the future of the emerging aircraft industry, they developed a pioneering spirit which has typified Smith throughout his bright career. His son David was also graduated from the Institute, in 1962.

Smith holds the prestigious Robert H. Goddard Award for professional achievement, the highest prize given an alumnus by the Institute, as well as an honorary Doctor of Engineering degree and the Herbert F. Taylor Award for service to the college. In addition, he served with distinction on the WPI Board of Trustees from 1975 to 1980.

At the Washburn Shops rededication on October 20, 1984, WPI named the Washburn Materials Processing Laboratory in honor of one of its preeminent graduates, a pioneer in his own right, Arthur E. Smith '33. A major contribution from United Technologies helped to make possible this new laboratory.

United States Steel Corporation

Both WPI and U.S. Steel can trace their roots to the inquiring mind and boundless energy of Ichabod Washburn, inventor, manufacturer and in later life proprietor of the world's largest wire mill, part of an industry he revolutionized. He invented machinery for making piano and hoop wire, developed a continuous hardening and tempering process, and built the first continuous wire-rod rolling mill in America. In 1884, his company, Washburn & Moen, joined other wire makers in organizing the American Wire and Cable Company. The firm was one of the principals in the Andrew Carnegie-led formation of U.S. Steel in 1901.

It was at Washburn & Moen that Harry G. Stoddard got his start in business, joining the company in 1886. Stoddard would go on to become general manager of the company and, later in his career, president and chairman of Wyman-Gordon Company and co-owner of the Worcester Telegram & Gazette Inc.

American Steel and Wire established the U.S. Steel Industrial Scholarship in 1920, and the U.S. Steel Graduate Student Loan Fund in 1979. Most recently, a major contribution from U.S. Steel supported construction of a Washburn machine shop.

Wyman-Gordon Company

In 1883, H. Winfield Wyman '82 and Lyman F. Gordon '81 opened Worcester's first forging shop to produce shaped metal parts. As the Industrial Revolution gathered steam in the 1880s, the demands of competition called for metallic strength, durability, speed, weight and lowered cost. For all these requirements, forging was often the perfect solution.

It was the transportation industry—largely railroads and later automobiles and aircraft—that gave Wyman and Gordon their first real opportunities. With the help of the inventive George Fuller, W-G was responsible for many breakthroughs in hardening and tempering steel. Today W-G conducts on-going metals research second to none and is the world's leading supplier of forgings for defense and space applications as well as for agricultural and other civilian equipment manufacturing. Currently, the company employs more than 50 WPI graduates.

Since 1920, Wyman-Gordon, through the company itself, the Wyman-Gordon Foundation and, indirectly, the George F. and Sybil H. Fuller Foundation, has been among the Institute's most generous benefactors and most recently has made a significant contribution to the Washburn project.

In addition, the Stoddard family, a name tied for all times to Wyman-Gordon Company and to WPI, has given major support for construction of WPI's Stoddard Residence and is responsible for the Stoddard Professorship in Management. The company's current president, J. Richard Bullock, serves on WPI's Board of Trustees. In December 1984, Robert Stoddard (son of Harry G. Stoddard), former president and chairman of W-G, chairman of the Worcester Telegram & Gazette Inc., and a WPI trustee emeritus, died. His obituary appears on page 55.

Additional Names in the Washburn Story

For nearly 25 years the Lufkin Trust has been one of WPI's most generous benefactors. In all cases, the fund has designated that its grants be used by mechanical engineering programs at WPI for the support of students pursuing studies having a close relationship to machinery and mechanics.

Augat Corporation has generously supported construction and equipping of Washburn's new X-ray diffraction laboratory. Additional lab space has been made possible by the Class of 1943.

A contribution from Francis C. Swallow '17 has funded a computer lab for student use, while Allen M. Mintz '48 has given a generous gift for Washburn's new metallography laboratory. The Class of 1944, through its 40th Reunion gift, has supported construction of seminar space, and a generous contribution from Stanley C. Olsen has helped create a student lounge in the Shops. Additional support has come from the Class of 1983 and other sources.

The college welcomes and is most appreciative of the support of these individuals and organizations.

By Roger N. Perry, Jr. '45, Michael Shanley and Kenneth McDonnell

Michael Carroll

Veteran mechanical-laboratory technician Joe Gale in one of Washburn's new machine shops.

Other Washburn Connections

George F. Fuller, 1896–1962.

Worcester Telegram

Robert W. Stoddard, 1906–1984.

Michael Carroll

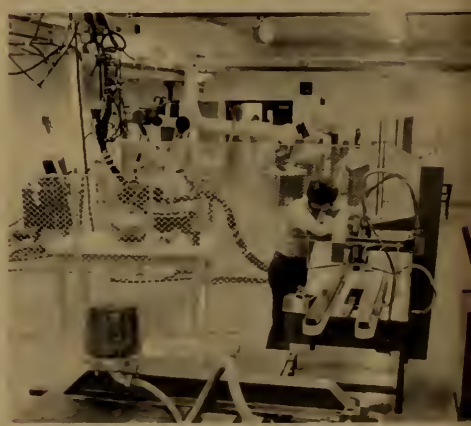
Dr. Thomas C. Mendenhall II, grandson and namesake of WPI's third president.

Sherry Horeanopoulos

Four generations of the Morgan family—Charles H., Paul B. '90, Philip M. and Paul S.—have served on the WPI Board of Trustees through much of the Institute's history.

One of eight machining models for individual student use. Significant funding came from Mrs. David Bailey, in memory of her husband, '25; C. John Lindegren '39; Edward G. Perkins '72 and Mrs. Jacob Perkins; Raymond J. Perreault '38; Rexnord Inc.; and the Class of 1959.

The Milton P. Higgins lecture hall, a 110- sea



The Manufacturing Engineering Applications Center (MEAC) works with companies—such as Emhart Corp., instrumental in its establishment in 1980—to apply robotics and flexible automation to industrial problems.

The Building at Work

Michael Carroll

The "common area" of the main machine shops contains specialized equipment to complement that in the machining modules. Major support from Raymond J. Perreault '38 and the L.S. Starrett Company helped underwrite the center.

Michael Carroll

A Class of 1959 gift provided funding for Washburn's machine shop demonstration room, which contains equipment identical to that of the eight machining modules.

William Denson

facility built above the old welding shop.

Michael Carroll

Located in the Arthur E. Smith '33 Materials Processing Laboratory, this Instron servohydraulic, computer-controlled, mechanical testing system evaluates the tension, compression, fatigue and fracture characteristics of metals, ceramics, plastics and other composites.

Michael Carroll

A Computer Science Department laboratory, with no fewer than 25 terminals, is located in newly created Washburn space. Class of 1958 contributions helped fund this lab.

Michael Carroll

These electron microscopes were gifts of the Lufkin Trust and the Wyman-Gordon Foundation. A Class of 1944 gift helped finance construction of the laboratory, structurally isolated from the rest of Washburn to eliminate outside vibrations.

Michael Carroll

Funding from the Ellsworth Foundation helped support construction of Management's departmental offices.

Mendenhall: The Place, the Moment, the Man

Thomas C. Mendenhall was WPI's third president, from 1894–1901. It was Mendenhall who as president found himself grappling with controversy surrounding the propriety of a commercial Washburn Shops—and the successful enterprise the Shops had become. He was well suited to the task.

Those were tumultuous times for WPI and for science and technology as well, as Mendenhall's grandson, Dr. Thomas C. Mendenhall II, recounted before a Washburn rededication audience in October.

"History," he began, "is full of coincidences as well as changes. The place, the moment, the man so frequently come together to produce interesting, exciting, tension-full occasions."

What follows are excerpts from Dr. Mendenhall's unforgettable keynote address.

The Place:
By 1882, the Shops had been making more than $33,000 a year for the college. The hydraulic elevator developed here was threatening to raise the whole institution right off the map and into big business. Which is ultimately where Milton Higgins' elevator went, I guess, under the Otis'.

The Shops was causing increased concern among many of the faculty, and trustees and many even in the community. The trustees were split over the question, but when 50 graduates were polled, "Do you think the commercial Shops should be continued?" they bellowed unanimously, "Of course!"

The Moment:
The last half of the 19th century witnessed an extraordinary outburst of activity in pure and applied science—Darwin's treatise in 1854 on the origin of the species, Gramme's dynamo in 1869, Maxwell's work on electricity and magneticism in

Thomas C. Mendenhall, WPI's third president, had to resolve the controversy over the Washburn Shops' commercial interests.

1873 and later his book on the theory of heat, Rayleigh's book on the theory of sound, the Philadelphia Centennial Exposition of 1876. All the while, Worcester was booming. Seven railroads served the city.

The Man:
He was born in 1841 in eastern Ohio of Quaker stock. Quakers, as you know, were not in those days quite as socially obliging as they may be today. They ran up and down the streets literally quaking, which could stop a good deal of traffic. Which may be why the English were glad to get rid of us.

He had an early interest in science. One time, for instance, his father, a farmer, sold a cow to a neighbor 25 miles away, and young Tom was given the job of leading the cow to the new owner, where he spent the night. While there he noticed some books, one being a Euclid's geometry text. "What are you giving me for driving the cow over here?" Tom asked the farmer. "One dollar." "How much is that geometry book?" "One dollar"—quite a sacrifice, because he had 25 miles to go back.

He was also interested at an early age in teaching—he got his first teaching certificate to teach in a local school which he had just finished, at the age of 16. At the age of 17 he was assistant principal in the village school—at $90 a year.

In 1873, TCM was appointed the first professor of physics and mechanics at Ohio State University. He was keen always to get money for books and equipment for his laboratories. One time, when he didn't have proper equipment, he borrowed a carpenter's lunchpail to use as a pendulum in a physics experiment.

He was quite interested in weather as well. You and I just click on the radio with its marvelous weather reports. Grandfather was instrumental in setting up a series of weather stations across Ohio and eventually, across the country. He had the ingenious idea of putting the latest weather information on the sides of railroad cars: "rain tomorrow" or "18 inches of snow" or something like that.

In 1886, TCM went to Rose Polytechnic Institute in Terre Haute, Indiana, as its second president. The founder and first president was Charles O. Thompson, who had been WPI's first president as well. Thompson had modeled Rose after Worcester Tech.

Three years later TCM left Rose to head the Coast and Geodetic Survey to map the whole country. He also worked to make the Alaska-Canada boundary line more precise, more exact. Those of you who have been to Alaska—you'll find there the Mendenhall Glacier, a rather handsome great bit of ice. I get about four postcards a summer always asking a rather unflattering "Is this you?"

Why did Worcester hire him? I suppose institutions always want to attract distinguished people for president. He was one of the first members of the National Academy of Sciences, and as a teacher he was in great demand as a lecturer. Maybe they thought they needed some changes made. Maybe they figured this was the man to do it.

Why did he accept? He'd been through change once at Rose, liberalizing the curriculum and reducing the importance of shop practice. Well, I think he saw Worcester as a challenge, and he knew he wanted to leave the government service because of the patronage hassle.

His initial question at Worcester was, "Are we one institution with several branches or are we two institutions?" And by 1896 he had worked out his own resolution of this situation.

"The only reason for the existence of the Shops," he wrote, "is the educational value of the training which they may give." And, "A very important part of an engineer's education is the acquisition of a familiarity with the best methods of shop management."

"There's another class of work which is in every way suited to a school machine shop and which should be sought for continually: the making of special machines, models, apparatus, instruments . . . and the like."

As his grandson and namesake I was summoned to stay with TCM for about two weeks after he retired in 1901. Every morning I was given a list of arithmetic problems and I had to solve them by suppertime. He had an enormous shop in which he was always doing all kinds of things. He took the temperature morning and noon and night all his life.

My wife discovered some years ago a lovely document in my grandfather's handwriting, dated 1912. It's called "Rejoicing."

"I rejoice in the love and companionship of my wife for over 40 years of our happy marriage.

I rejoice in my son and his work as a scientist and physicist.

I rejoice in my many friends, students and colleagues with whom I have enjoyed working and friendship over the years.

But at this particular moment I rejoice most of all in the fact that I am not and never have been a member of the National Education Association.

Thomas C. Mendenhall II is president emeritus of Smith College.

Michael Carroll

A MEAC teaching robot seems to have captured this little visitor's attention.

Michael Carroll

Michael Carroll

More scenes from rededication day: Dr. George Hazzard (top, left), WPI president emeritus; Dr. Thomas C. Mendenhall II, president emeritus of Smith College, who gave a talk on his grandfather's WPI presidency; and Dr. Edmund T. Cranch, president of WPI. At the open house (above) of the restored Washburn Shops, a student demonstrates the capabilities of a General Electric industrial robot in the Manufacturing Engineering Applications Center (MEAC).

By Michael Shanley

Shakespeare and the Engineer

The humanities, once the poor cousins of the science and engineering disciplines at WPI, now stand straight and proud.

It's 1960 and your hair is short. You wear white socks and loafers. John F. Kennedy has just been elected President, and scientists are excited about a new discovery called the laser beam. Hitchcock's *Psycho* is packing the movie theatres. Arnold Palmer has won both the Masters Tournament and the U.S. Open, each time with a come-from-behind charge. Floyd Patterson has KO'd Ingemar Johansson to regain the heavyweight championship of the world.

You're one of the 1,100 young men enrolled at Worcester Tech. On campus, Morgan and Olin halls have just been built. Harrington Auditorium, Goddard Hall, Gordon Library and the Wedge don't exist. Nor do Stoddard, Ellsworth or Fuller residences. Tuition is $1,300 per year, room and board another $730.

Regardless of what your major is, you'll take composition and reading during your freshman year. Sophomore year means U.S. and world history. You'll take a semester of political science in your junior year. As a senior, you may take a humanities elective, of which there are five to choose from.

You might consider the humanities to be a waste of time. All those names and dates—who needs them. And anyway, what's Shakespeare to an engineer?

Plenty has changed in 25 years. The world is a different place. So is WPI. And so is the Humanities Department.

The 1960 scenario is representative of the role humanities played for decades at WPI: a few English and history survey courses, little of anything else.

"Humanities courses here were always very structured," notes Dean of Undergraduate Studies William R. Grogan '46. "Students didn't take them seriously and neither did the faculty, for the most part."

If the humanities didn't get a great deal of respect, it was no reflection on the department's faculty or on the school itself. It was more just a product of the times.

"The department had a different function entirely then," recalls Donald E. Johnson, Professor Emeritus of History and former Humanities Department head. When he began his career at WPI in 1946, he says, "Our role was a secondary one, as a service department."

While it would be unfair in many ways to compare the old Humanities Department with the new, there is no denying the massive transformation in both theory and structure.

Now, under the degree requirement known as the Humanities Sufficiency,* students choose a topic of interest, take five or more related courses and then complete a final independent study project. The Sufficiency may be limited to a single discipline—American literature or Eastern philosophy, for example—or it may involve several disciplines—perhaps the history, literature and philosophy of a particular period. In either case, the final project examines a single theme.

The possibilities for the Sufficiency are limitless, the topics as varied as the students themselves. "A Parallel Between Othello and the Passion of Christ," "Remaining Human in the Modern World," and "An Analysis of Wagner's *Lohengrin*" are a few examples.

The catalyst for this restructuring was, of course, the WPI Plan, put into place in the early 1970s. But for some time before the Plan, a handful of outspoken faculty members had been urging a greater emphasis on the humanities. "These boys have to make a life as well as a living," English Department head Edwin Higginbottom would say. "It's the old story all over again—if your son asks for bread, do you give him a stone?"

In the mid 1960s, the curriculum committee, chaired by Dean Grogan, then a Professor of Electrical Engineering, tried to offer a little more in the way of bread. A bachelor of science degree in Humanities and Technology was established, and electives were added. "Those changes, while not sweeping, may have had the effect of pulling the plug out of the bottle, letting the genie loose," says Professor Johnson.

It was the planning committee, however, that truly elevated the humanities to first-class status. When these Plan architects made the Sufficiency one of four degree requirements, they removed any doubt about the importance of the liberal arts at WPI.

"Basically, there are two schools of thought about humanities and the engineer," says Grogan. "One argument holds that a student should get a little bit of everything, which means required survey courses. The second argument—the one we ultimately embraced—says that it's better to master one area than get a superficial sprinkling of many."

And what of the argument that a student can go through four years here and never study Plato or Aristotle, Homer or Shakespeare, the great events of history and religion?

Humanities Department head Jo Ann Manfra fields that one. "In the best of all possible worlds, I would want students to study more liberal arts. But we don't have that option. What we try to do is give them quality and encourage lifelong learning. Our goal is to introduce a critical thought process that will carry over into their other work. We want the students to understand ambiguity, complexity and nuance. Things aren't just black and white—in engineering or the liberal arts—and that's a point we want to get across."

**The term is derived from the concept that students will develop "sufficient" understanding of an area of the humanities to engender a lifelong interest in that area.*

Michael Carroll

Michael Carroll

Michael Carroll

Perhaps the Department's most impressive growth has taken place within the philosophy-religion-ethics area. These once neglected subjects are now a vital part of the curriculum. Assistant Professor of Religion Ruth L. Smith, Associate Professor of Philosophy Iris M. Young, and Assistant Professor of Philosophy Roger S. Gottlieb (left to right)—all relative newcomers—are active researchers whose broad interests give students a wide range of courses and projects to choose from.

In the years following approval of the Plan, the Department of History and Foreign Language and the Department of English (there was, as yet, no combined Humanities Department), like the others on campus, were faced with a staggering amount of work. New courses had to be developed, and old courses had to be adapted to the seven-week term. Clear standards for student work in interdisciplinary areas involving the humanities also had to be established.

Help in those early years came in the form of grants from the National Endowment for the Humanities (NEH), the Andrew W. Mellon Foundation and the Rockefeller Foundation.

"Those grants were invaluable," says Professor Johnson. "So much time had to be spent on curriculum planning and development. It was a huge task."

In the mid-1970s, as the liberal arts at WPI grew, an administrative decision was made to unite the various disciplines under a single umbrella; the Humanities Department was officially created. "It was simply a logical step," says Professor Johnson, who served as head of the department until his retirement in 1983.

What might surprise those with a timeworn view of engineering schools is the healthy state of the performing arts at WPI. Musical groups abound—the Brass Choir, the WPI Band, the Jazz and Woodwind Ensembles, the Polytones and the Stage Band. Students interested in music can choose from a variety of classroom and performance offerings. Assistant Professor of Music Louis J. Curran, Jr., has for years taken the Men's Chorus on tours to Europe, Canada and the West Coast.

The theatre program, begun in the 1960s by Professor of English Edmund M. Hayes, has grown by leaps and bounds. Susan Vick, assistant professor of Drama-Theatre since 1981, now directs the production of one major play each fall and works with Masque, the student theatre group, on a production each spring. Last fall's production of "You Can't Take It With You" featured Associate Professor of English Charles Heventhal in a leading role. Heventhal, who as a member of the planning committee was instrumental in molding the Humanities Sufficiency, has also played the title role in Brecht's "Galileo."

Also in the spring, Professor Vick oversees "New Voices," a week of plays, dance and music written and/or performed by students.

Professor of Music David P. McKay and Associate Professor of English Kent Ljungquist have produced two operas based on literary works: Charlotte Perkins Gillman's "The Yellow Wallpaper" and Edgar Allen Poe's "The Devil in the Belfry." In both cases, McKay wrote the music, and Ljungquist adapted the text. The operas were performed on campus at the Higgins House. Professor McKay has also composed a number of original works, conducted music on four albums and co-authored a prize-winning book. Ljungquist, co-editor of the national Edgar Allen Poe newsletter, will have a book about Poe published this spring.

Today, the Humanities Department is second in size only to Electrical Engineer-

Michael Carroll

The lone figure in the foreign languages is Lieselotte Z. Anderson, lecturer in German. She teaches ten or more sections per year, accommodating both the beginner and the advanced student. Those interested in other foreign languages can make arrangements to study at another of Worcester's colleges.

JO ANN MANFRA: LAWYER, LEADER, LEARNER

Michael Carroll

There were those who told her she was crazy to get a law degree—she didn't need it. Crazy, too, to accept the chairmanship of the Humanities Department—she didn't need that either, they said.

But they understood little about this determined, energetic woman who earned not one but two law degrees (from Suffolk University and Harvard University law schools) while carrying a full-time teaching load, who accepted the five-year appointment as head of the second largest department on campus, and who loves it.

"When I walk into the office," says Jo Ann Manfra, "I never know what's going to happen. The faculty is so active they exhaust me. It's a good kind of exhaustion, though. They're constantly on the move—dynamic, committed." Words which well describe Professor Manfra herself.

"I operate better in an invigorating environment," says Manfra, a graduate of State University of New York (SUNY) at Cortland and the University of Iowa. "The Mellon grant and other new things have given me a shot of adrenaline. It's an exciting time."

She cautions, however, that requirements for a department head include "a good sense of humor and the ability to step back from it all."

One of Professor Manfra's own research interests is 19th-century American Catholicism. The author of several articles, she is working on a manuscript entitled "Bishops of the Republic: The Making of An American Catholic Hierarchy, 1789–1851."

Professor Manfra just had another article—"Serial Marriage and the Origins of the Black Stepfamily: The Rowanty Evidence"—accepted for publication in the prestigious *Journal of American History*. Co-author of the article is Robert R. Dykstra, Professor of History and Public Policy at SUNY at Albany, who also happens to be Manfra's husband.

The commuting marriage works out pretty well, Manfra says, since her husband has arranged his schedule so that he spends three days a week in Albany and four days in Worcester.

Over the years Manfra has been an active participant in the campus community, serving on virtually all the major academic committees. In 1980 she was faculty advisor at the Washington D.C. Project Center.

A member of the Massachusetts Bar and the U.S. District Bar, she is consultant to the Legal Systems and Law Enforcement IQP area and advises student projects that examine and evaluate the legal process.

Despite all this activity, she says, "I never feel like I've done it all. There's always more to do."

ing. In quality, the faculty can hold its own not just among engineering colleges, but among comparably-sized liberal arts colleges as well. The 20 full-time tenure track and 10 part-time or visiting faculty are an active group. Virtually all are engaged in research in their respective fields.

Associate Professor of History Peter S. Onuf, for example, last year was awarded a long-term fellowship at Worcester's American Antiquarian Society (AAS). This distinguished national award was financed by the NEH. Professor of English Lance E. Schachterle is an AAS research associate working on an edition of James Fenimore Cooper's *The Spy*. For years he has worked as an editor on NEH-financed research to produce the definitive series of Cooper texts.

Professor of Religion and Social Ethics Thomas A. Shannon is a nationally recognized expert in the field of ethics. The author or editor of six books, he has lectured widely and has been featured in newspaper articles and on radio and television shows. He co-edited with JoAnn Manfra *Law and Bioethics*, a book on the major court decisions in that field.

Professor of History John F. Zeugner has twice been awarded fellowships to teach at universities in Japan. An outspoken critic of Japanese higher education, his articles on the subject have appeared in the *New York Times* and *Change* magazine. He has also published as both an historian and a fiction writer.

Deborah M. Valenze, an assistant professor of history, will have a book published this fall on popular religion and female preaching in industrial England.

Because the history of science and technology is particularly germane to a college like WPI, the Humanities Department has two specialists in that area. Professor of History Michael M. Sokal, a nationally acknowledged expert on American psychologist James M. Cattell, has edited a book of Catell's letters. He is working on what will be the definitive biography of the man and recently received a major NEH grant to complete the work. Sokal has also written several book chapters in the fields of the history of science and technology, psychological testing and the history of psychology.

Associate Professor of History E. Malcolm Parkinson specializes in the history of European science and technology. He has published widely, with particular interest in jousting and the medieval tournament. Last fall he took a sabbatical from WPI to become a visiting scholar at New York University, joining 15 other scholars of medieval culture in a seminar program funded by the Mellon Foundation.

Despite all the professional activity within the department, Professor Manfra sees no indication of what educator Clark Kerr called "the cruel paradox that a superior faculty results in an inferior concern for undergraduate teaching."

"Professional development can't help but *improve* your teaching," she says. "What is a college for if not to be on the cutting edge of knowledge? That means students *and* faculty. As for undergraduate education, commitment to teaching is a given."

If a great deal has been accomplished in the humanities, there is more to be done. A recent $250,000 grant from the Mellon Foundation represents a giant step into the future. First on the list of priorities is a reexamination of the programs already in place—the Humanities/Technology or

Michael Carroll

Associate Professor of History James P. Hanlan, co-director of the Living Museums program, oversees the projects done at Mystic Seaport in Mystic, CT. Hanlan's varied professional interests include American labor history, social and urban history, history of the family, and textile communities in New England.

Science major, concept courses, the Living Museums Program, Light and Vision (a course that examines how scientific ideas originate and change), and the Writing Resources Center, which provides students with technical assistance in the preparation of research papers.

In addition, the grant will be used to provide new faculty with the time they need to explore interests in other disciplines, and thereby better advise student projects that combine humanities and technology.

The department also intends to address what many see as a major shortcoming of the program—the fact that most students complete the Sufficiency in their sophomore year and thereby end their association with the Humanities Department.

"We'd like to have them do more," says Professor Manfra, "but given their schedules, that can be tough."

One option is a senior seminar of some sort, perhaps with an interdisciplinary base. The first step is determining how best to make the seminars attractive to students, who already have a demanding major course schedule.

A report issued last fall by the National Institute of Education cited a serious flaw in higher education: "The college curriculum has become excessively vocational in its orientation," part of the problem being a prevailing belief that "the best insurance in a technological society is a highly specialized education that will lead to a specific job."

The attitude may be understandable, given the cost of a college education and the intense competition in the job market, but many observers see it as a serious threat to the fundamental concept of a complete education. WPI has clearly defined its stand on the issue.

"We see the humanities as a vital educational experience in its own right," says Dean Grogan. "Its application is through the development of the individual. We don't want to graduate people who are just technically qualified. We want to graduate people who have developed their intellect."

This theory harkens back to Professor Higginbottom's bread versus stone remark and the Shakespeare-engineer relationship. The humanities, besides teaching us about the world we live in, teach us about ourselves—a subject well worth probing, regardless of career goals. It's also a subject from which a lifetime of learning can be culled. Which is one of the reasons why Shakespeare and the engineer get along quite well here in Worcester.

Michael Shanley is Director of the WPI News Bureau.

PROJECTS WITH PERMANENCE

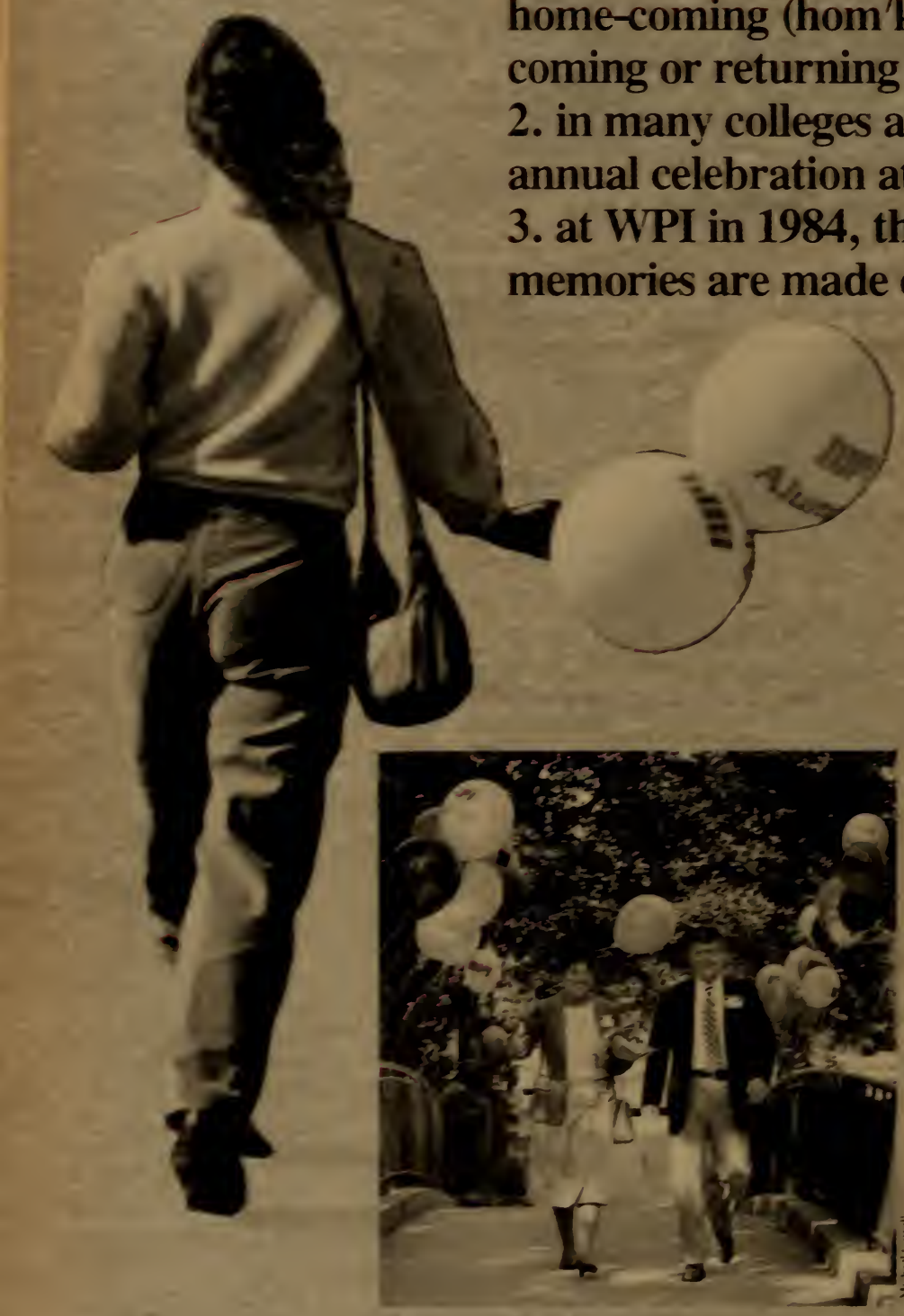
One of the IQP programs developed through the Mellon Foundation grant in the mid-1970s was the Living Museums Program, which has evolved into an extensive project series.

The program is directed by James P. Hanlan and Malcolm E. Parkinson, both associate professors of history.

Students, usually guided by one advisor from the Humanities Department and one from a science or engineering discipline, work with the staff at one of New England's many outstanding museums. They have access to documents and artifacts; sometimes the projects culminate in permanent exhibits.

Projects have been done at the Mystic Seaport and Mark Twain House in Connecticut, Slater Hill Historic Site in Rhode Island, and the Peabody Museum, Higgins Armory Museum, Worcester Science Center, Sturbridge Village, Merrimack Valley Textile Museum, and the Worcester Historical Museum, all in Massachusetts.

In the photograph at left, a student works on a sailing simulator, now a featured exhibit at the Peabody Museum in Salem, MA. The finished product is a large model sailboat enclosed in a glass case, with the actual mechanism hidden below the blue carpet "water." A museum visitor simply touches a control and a breeze begins to blow inside the glass case. Then, by manipulating three controls—one for the rudder, one for the mainsail and one for the jib and staysail—the visitor can actually tack, jibe, reach off the wind or run before the wind.



home-coming (hom′kum′iη), n. 1. a coming or returning to one's home. 2. in many colleges and universities, an annual celebration attended by alumni. 3. at WPI in 1984, the kind of event that memories are made of.

Yes. 1984's edition was perhaps the most ambitious Homecoming ever staged. But the weather was flawless (for once), the turnout was huge (with a record attendance at WPI's football victory over Coast Guard), and the sheer number and variety of events and programs provided nearly everyone with something to cheer about.

From the continental breakfasts for graduates in chemical, civil, electrical and mechanical engineering, to the 5-Km road race (won by Bob Ferran '74), to the annual Homecoming barbeque, to tailgating (gaining in popularity each year), to the annual rope pull (somehow the freshman won—again), to the varsity football, soccer and field hockey games, to fraternity dinners and parties, to the Athletic Hall of Fame induction and dinner, to the alumni rugby game, and lots, lots more—well, you might say Homecoming '84 packed as much into a weekend as is humanly possible.

One special stand-out was a new alumni award, the Ichabod Washburn prize, given to three graduates in recognition of their outstanding professional achievement. They are Barbara Bain Gattson '74, Michael Graham '74 and Ronald Howard '77.

So have a look, if you please, at the photographic record we've made of Homecoming '84 on these pages and throughout the Class Notes section of the *Journal*. And remember, it's not too early to start making plans now for *next* year's autumnal festivities on the Hill.

Michael Carroll

Barbara and David Johnson '60.

Michael Carroll

Homecoming '84 (clockwise from below): *Gordon Crowther '37, Mr. and Mrs. Robert Bierweiler '43 and Edwin Campbell '43 at a reception for the alumni who worked on record-setting 1983–84 Alumni Fund; Mrs. Virginia Cranch, a familiar face at many alumni functions; Jan and Morgan "Mo" ('61) Rees, one of WPI's greatest-ever wrestlers, at his induction into the WPI Athletic Hall of Fame; Fred Pomeroy '27; Wally and Theresa Metcalf Catanach, both '80, with daughter, Monica.*

Michael Carroll

Michael Carroll

Michael Carroll

Michael Carroll

Michael Carroll

A more natural family portrait (left) you'll never find; above: the agony of de-feet.

Michael Carroll

Michael Carroll

Michael Carroll

Homecoming '84 (top to bottom): *Melanie Flynn, wife of Matthew Flynn '82, shows off their pride and joy, Andrea; Robin Gately '86, of Dorchester, MA, in the spirit of things; the Lambda Chi's, predicting gridiron victory over Coast Guard.*

Six to Athletic Hall of Fame

At Homecoming '83, the induction dinner for the eight charter members of the WPI Athletic Hall of Fame virtually stole the show. And at Homecoming '84, in the evening of September 22, six more exemplary members of the WPI family joined the ranks of one of the college's most exclusive fraternities.

• The late **Ivan "Pete" Bigler,** head football coach, 1923–40; head basketball coach, 1922–41; and head baseball coach, 1922–42; dedicated a significant portion of his life to WPI and its intercollegiate athletic program. He led WPI to more football victories (42) than any other coach except Bob Pritchard (a 1983 Hall inductee). He coached the Engineers' first (1938) undefeated football season, as well as the second-place New England standing of the 1938–39 basketball campaign.

• **Earl Bloom '54** was one of the greatest athletes to ever wear the Crimson and Gray. His 15 varsity letters are the most earned by any WPI athlete. A workhorse running back in the 1954 undefeated football season, he also scored the winning goal in the 1954 basketball game against UMass. He performed in several track and field events. And he played both singles and doubles in tennis.

• **William Graham '31** earned 11 varsity letters. Despite a football injury that sidelined him for most of his junior year basketball season, he led all area collegiate scorers in 1930. As an end, he was a scoring threat on the football field. And as the ace pitcher on the Engineer baseball staff, his career was highlighted by his one-hit, 12-strikeout performance against Clark University in 1929.

• **Donald Lutz '67** won the Outstanding Athlete Award in his senior year, the result of a ten varsity-letter performance at WPI. He was an All New England guard on the basketball court, with 1,212 career points, fifth in the WPI record books. Despite never playing soccer before his sophomore year, he was the team's star goaltender in its 10–0–1 1965 season. And on the baseball field he was both an offensive and defensive threat.

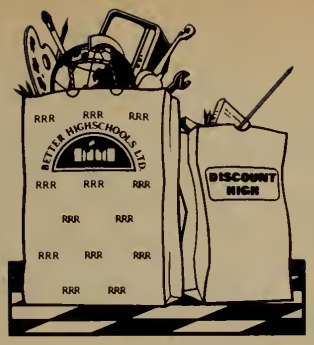
• **David McEwan '39** won 12 letters and was a three-sport team captain. One of just two freshmen to earn soccer letters in 1935, he would go on to earn All-America and All New England honors. In basketball, his four-year performance led the team's 44–17 record, and he was the Engineers' leading scorer as a junior. He was also captain of the golf team.

• **Morgan "Mo" Rees '61** was a three-sport captain and winner of 11 varsity letters. As a student, he was a player-coach in wrestling and, as much as anyone else, helped develop it into one of WPI's most successful sports. He was WPI's first All New England wrestler, and compiled a 23–3 dual-meet career record. He earned four letters in football, playing both offense and defense, and captained the 1960 team. And in the springtime, he was an outstanding high hurdler in track. Since graduating, Mo Rees has remained active in the WPI wrestling program, helping WPI to become a New England power.

It is well worth noting that as students *all* of these alumni were members of Skull—the Senior Honor Society. Congratulations to each and every 1984 inductee of the WPI Athletic Hall of Fame.

Michael Carroll

Principals at the 1984 Athletic Hall of Fame dinner, flanked by Patricia Graham Flaherty '75, Poly Club president, and Dr. Edmund T. Cranch, are inductees David McEwan '39, Donald Lutz '67, Earl Bloom '54 and Morgan "Mo" Rees '61.



A high school is a high school.

Jack Spratt

But every high school student is different.

Mass education is fine, says Educator Theodore R. Sizer, but standardized education is not. In *Horace's Compromise*, he describes the plight of the American high school teacher—trapped between too many demands from the system and too little time for the students.

It doesn't have to be that way, Sizer argues. Chairman of Brown University's Education Department and formerly headmaster of Phillips Academy, Andover, and dean of the Harvard Graduate School of Education, Sizer directs the Coalition for Essential Schools. It's essential, he says, to revamp the high school's traditional structure.

"High school is a rite of passage. Rituals are important, and rituals are embedded in the structure. If high schools didn't have age-grading, who'd go to the junior prom?"

In *Horace's Compromise*, you say that all high schools are alike. Could you describe the typical high school? Most high schools are very large and impersonal. All start before 9 o'clock in the morning. Mom and Dad leave the kids off, that's the theory: Schools start early so the parents can leave the kids and go to work. I know of none that start as late as 9 o'clock.

All break up their day into what they call "periods," usually somewhat more than 40 minutes and somewhat less than 60 minutes. Kids take at least five or six of those a day. It's all set—it's been that way since the 1890s.

Almost without exception, high schools are arranged horizontally by the age of the kids and vertically by subjects. Almost invariably those subjects are called English, mathematics, social studies and science, language arts, and so on.

High schools do vary by the social class of the students. What doesn't vary is the structure.

What are the social class differences? One way of defining social class is parental income. Another is what Ed Banfield [*The Unheavenly City: The Nature and Future of Our Urban Crisis*, 1968] calls orientation to the future. I know some very low-income kids who are very upper-class and very aggressive academically. But by and large low-income kids tend to be kids who don't put much value on investing in the future—which means doing their homework, or the ditch-digging of learning French verbs in order that sometime they might be able to speak French—in short, to do the things *that will get them somewhere.*

But there are less abstract differences. On the whole, the lower the income of students served, the larger the total load of students on the teacher. In city schools, the teacher usually faces—on the roster—five classes a day of 35 kids, which is appalling. In a suburban public high school, the teacher has five classes, or for an English teacher four classes, of 25 kids. In a very rich suburb or a very wealthy private school, the ratio may be one to 12. But if a kid's parents are low income, chances are the teacher's load is 175 kids. That's the most dramatic difference.

Another difference is that a low-income kid's chances of having textbooks for every course are lower. And that kid's chances of having *up-to-date* books for every course are lower still.

In a school with many low-income kids, many of the problems of the street wash into the school. For example, I spent some time in a school where 20 percent of the kids were already legally emancipated—they were under the age of 18, but the courts had termed them adults—and another 40 percent were *de facto* emancipated, that is they had no home addresses. Sixty percent of the kids had no home addresses. Probably very few "existed" in the census. They lived in burnt-outs. School was a health clinic, a restaurant, a sanctuary. The fights, the terrors, the drug pushing, the horror of those kids' lives were reflected in the school.

I visited the principal of that particular school in December some years ago and asked, "Has this been a good year? How's discipline?", and he said, "It's been a good year, no cutting." "What do you mean?" I said.

"There have been no razor and knife fights yet, it's all been fists."

That's not the way it is at Phillips Andover. No. The poor in this country continue to get the short end of the stick, although gross expenditures per student in many big cities are as large as those in suburban schools. Of course, much of this is soaked up in special services. Special services are needed, but they distort the data.

What's surprising, though, is that the poorer school is still organized just like every other school—even in cases, like a high school I visited last week, where half the kids couldn't read or write. Teachers teach grades made up of youngsters of a particular age. Teachers teach their own special subjects, each department operating blissfully in isolation from every other one. Seven periods a day. Every high school in New York City is the same—every last district—in its daily routine.

Those students who can't read and write still go to English and social studies and—And economics class. I talked with an economics teacher who taught the entire course without ever asking the students to read, even from the blackboard.

"What do you do?" I said.

"Well," he said, "we run a Junior Achievement program. We decide on a product to make and then sell." They turn the classroom into a factory and make the product—this year, they bought little calendars and put them in plastic folders with the school seal on them. Then the class worked out a marketing program and designed advertising posters—they did do that much writing—and then they sold the calendars in other classes.

It was a class in practical marketing, but it was called economics. The school can say it has a 12th-grade economics class, but the kids can't read. The teacher says, "They can't read, so I don't try to make them read," which is to say, "I've given up."

The conspiracy is school-wide. Everybody says, "You can't read, so we will avoid the issue."

Until they learn to read and do elementary mathematics, there's no point in giving students high school-level work. They can't read—and, God, there's nothing else the kids can do, because without that, they're slaves in society.

To say, "We're going to teach our students economics, health education, Bio I," or to play the silly game that everybody, even the illiterate in their home language, will start to learn French—the city of Baltimore now has a requirement that everybody learns a foreign language, whatever their proficiency is in English—sounds terrific. But it's silly.

We have a horrendous problem here, a fundamentally complicated problem.

If the structure is so irrelevant, what keeps it in place? High school is a rite of passage. Rituals are important, and rituals are embedded in the structure. If high schools didn't have age-grading, who'd go to the junior prom?

Graduation *must* be related to age, because graduation in many communities is a signal that it's all right to get married. It has nothing to do with whether a person knows English, it has to do with whether a person is old enough to get married. We don't tamper with these things because they're important to the culture for reasons that have nothing to do with educating students.

Have the high schools ever worked? High schools have always worked for certain groups of kids, the students whose particular incentives seem to fit with what the schools want to do. Kids who have pressure from outside the school to do well what the school wants done well. Kids who don't have to worry about protecting their flanks all the time.

As a very wise principal told me in a conversation, "Look, I will show you an effective high school—if you give me just one power."

I said, "What's that power?"

He said, "Let me pick the parents."

He was absolutely right. Let me pick the parents—I'll teach in a barn and the school will succeed.

Neither students nor schools get to pick their parents. There was a time when more of the students who actually went to high school were likely to respond to the system's incentives. As recently as 1950 only half the age group finished high school. Today, the percentage of diploma recipients is somewhere between 70 and 75 percent. Enrollment is somewhere over 90 percent—the percentage will never reach 100.

The second world war was fought by an army whose average school completion level was the eighth grade. The Vietnam war was fought by an army with a high school diploma. Between those two wars, there's been a social revolution: mass high school education for the first time.

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Theodore Sizer, outside Brown University's Education Department offices: "It saps a teacher's morale when somebody else is making all the important decisions about students that teacher knows better."

Today, the majority of American schools are very nice schools. They aren't ill disciplined. They aren't dangerous. They're full of happy, friendly kids. A lot of them have great fun striking their bargains, going through in mindless, happy fashion.

But for many of these students, many of whom wouldn't even have been in high school in 1947, the incentives are all wrong. If what a student wants is a high school diploma, and if the student has no particular ambitions for some sort of technical, specialized career, and if the student knows that the way you get a diploma is collecting Carnegie units, which means serving time, then the student is likely to say, "Well, I'll serve time doing as little as possible." Which means not being truant more than X days, not cutting-up too much. "Do the minimum, and I get as many Carnegie units as the person who breaks his back. Why do more? We'll both wind up with the same diploma."

Current incentives value expenditure of time. Some states call it *seat time*, a wonderful phrase, and in the name of excellence, they measure it in minutes per year: If a school has 36,000 minutes of academic seat time in California, the school gets a bonus. So kids say, "I'll play the game, turn on the clock."

If we said, "You get a diploma if you show us you can *do* some important things," then we would get a different result. Get the incentives right, and you can teach anybody anything.

So turning high school into a mass enterprise is part of the problem? The problem isn't mass education. The problem is the assumption that standardized practice is the route to high standards—when in fact the opposite is true, because we're all different.

A lot of people these days just don't understand that. They think that by cen-

"The problem isn't mass education. The problem is the assumption that standardized practice is the route to high standards—when in fact the opposite is true."

tralized regulations and standardized practices, high school will improve.

Oh, high school will improve a little bit, because it will go from mindless to marginally less mindless. If you have everybody take aspirin, you are going to cure a few headaches.

Competency testing by the state, to make sure everyone has learned the same things, is the lesser of two evils. The greater of two evils is the state that says to the school, "There will be one syllabus and we will decide it and you will administer it to the students so-and-so-many minutes per day." That is, everybody will use the same, specific program, all in the name of excellence.

And in the name of equity as well? It's fair because everyone is getting the same thing? That's right. Everybody will have their left finger amputated because a few may have a left finger that needs to be amputated.

And economy too—It's very simple. You set up an assembly line and have an ax going, bang, bang, bang. You can whack a whole lot of fingers. It's silly, absurd.

But the alternative means trusting the teachers. Some of them don't deserve the trust, some of them do. But unless we trust the teachers, we won't get more teachers we can trust. It's a vicious circle.

If we make the job attractive, make it a job which has some authority, then more people who are deserving of that authority will enter the profession. If we reduce the autonomy of the position, we'll drive out the best people. There it is.

Running down teachers is a popular thing to do at cocktail parties. Have teachers gotten a bad press? Yes. I think the current teaching force is stronger, as a whole, than it has ever been. But the job, as it's structured in many high schools, is impossible. Many very good teachers do journeyman's work, many journeyman teachers do terrible work, simply because there's no alternative.

If we get the conditions right—better, not right—we'll find that a lot of teachers will do a lot better and be a lot happier.

One condition, you've already suggested, would be fewer students. What are some others? More authority for the teachers. Control over their own time and materials. And authority to handle kids directly, instead of always having to refer to this or that, or send them somewhere else.

It saps a teacher's morale when somebody else is making all the important decisions about students whom that teacher knows better. That's why in private schools, many of which give much more authority to the teachers, morale is often quite a bit higher than in the public sector, even though salaries may be lower. Those teachers have some control.

Teachers, of course, must be prepared to make compromises. If the goal is to reduce the number of students per teacher, the compromise might be to teach more subjects to fewer students. If, for example, I'm prepared to teach both English and social studies, instead of teaching social studies alone to 160, I can teach English and social studies to 80. This will cut in half the number of kids I have to get to know. The compromise is that I have to teach a subject in which I didn't happen to major in college. To me, that's a much readier compromise.

But such a compromise involves a change in certification laws. And, for the teacher, that kind of compromise means taking risks, working hard, and working in a team.

Are you saying it is a compromise for teachers to have to work in a team? For some teachers it is, because it means admitting to your colleagues, "Gee, I just don't know English very well, you've got to help me." Some teachers don't want to collaborate with each other.

On the other hand, teachers are already forced to teach outside their specialties. Whenever a school board cuts the number of teachers, then the teachers with the most years are told, "You can stay, but you have to teach an unfamiliar grade, an unfamiliar subject"—But within their certification. Of course, that certificate could be 20 years old. It may be a "general" certificate.

I talked with the headmaster in a very distinguished Boston public school where a kindergarten teacher was being asked the following year to teach 12th-grade physics, because her certificate was a general certificate. She had the right seniority, the right race. We joked about this, and said, "It'll never happen, it'll never happen." A year later, it had happened. She retired early. She was an excellent kindergarten teacher, but some computer bounced her into physics. Stupid.

Everyone of us has one of those horror stories about the teacher who doesn't know the subject he or she is teaching. A lot of teachers don't know their subjects, but many do.

The real problem is that there is no incentive for those who don't know their subjects to learn more about them. And another thing—no one ever sees these incompetent teachers at work. There's no one to watch them. If they say something wrong, no one knows. And, often it's not even that the teacher is incompetent, it's that he just doesn't know.

When schools start teaching in teams, someone else will be watching. I sat with a school principal in a social studies classroom where the teacher said that the reason the Chinese came to the West Coast in the 19th century was because it was cheaper to bring them here than to send the dirty laundry to China. And that wasn't a joke. I almost fell out of my chair and so did the principal, but if he hadn't had a visitor to show around, he never would have heard.

Your Coalition for Essential Schools will try some of these ideas? What we're going to try to do is join together a small group of schools, 15 to 25 of them, all of

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which agree to a very simple set of basic principles and which try to put these principles into practice. We'll spend five to ten years working with them and see what we can learn.

The principles? No one will get a diploma except on the basis of mastery. No teacher will ever have more than 80 kids. The basic pedagogy will be what we call coaching. The kids will be expected to do the work, while the teachers support them. The expenditure per pupil will not increase by more than 10 percent. Among the compromises such a school will be prepared to make is that it will not be a comprehensive service center.

No two schools will put those principles in effect in precisely the same way. Nor should they.

There are a lot of schools out there that say they'd like to try. What the Coalition staff is doing now is visiting schools who've expressed interest. We're meeting good people, who want to do right by the kids. That's a cause for optimism.

But 15 to 25 high schools, out of thousands in the U.S., are a drop in the bucket. Salk didn't give his vaccine to everybody in the beginning. It's an experiment—an experiment in the schools.

The 15 to 25 schools will be enormously diverse. There's a great distance between many of the schools we are visiting, even when they are as geographically close as an inner-city high school in Baltimore and a suburban high school in Columbia, Maryland.

What's been interesting is that a disproportionate number of the schools serving the poor have expressed interest. Why? They say they don't have much to lose.

Some people have criticized your plan. They usually cast their criticism this way: "You're talking about giving an 'intellectual' education to kids who will become ditch-hole diggers. *They* don't want a liberal education." By "they," the critics mean the poor and the minorities. "*They* should be trained up to be service workers." I find that argument easy to knock down.

What's your rebuttal? "Thomas Jefferson would be surprised to hear you say that." Just because you're black and poor doesn't mean you're dumb. Just because you're rich and white doesn't mean you're smart.

But people really say things like: "Just send *them* to vocational school."

Learning to think is vocational training, whatever you do. Yes. And, of course, a student can learn to think in what appears to be vocational, as well as academic, training. Remember, no two schools will put our principles into action in the same way.

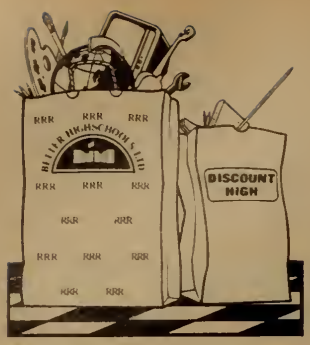
One of the teachers I describe in my book was a person I called Charles Gross. He was an electricity teacher. The day I was there, he had his students up at the boards doing their circuitry. Most of those kids wouldn't be in school if they weren't doing hands-on work in electricity, which they saw as a trade that they were likely to use afterwards.

But Charles Gross wasn't primarily teaching them the techniques of electricity, because he said the technology of the trade changes every five years and anything taught in school would be quickly obsolete. As the students worked at the board, he would walk behind one and say, "Billy, what would happen if you switched that differently?"

And Billy would point—always. Mr. Gross would say, "Billy, I'm blind, you've got to tell me." So—to put it pompously—Billy would engage in the careful description of hypothetical deductive reasoning. If he did this, then that would happen. But on the other hand, that would lead to this further result. A very complicated, abstract train of consequences. And the youngster would have to say all this in precise language—he wouldn't have to write it, but he would have to say it.

A vocational teacher has only 50 students. Charles Gross knew those kids, one by one. His teaching was very sophisticated basic, basic, basic training—not just "vocational" training in electricity. It wasn't taught by *Dick and Jane*. It was taught in a way that held the attention of those particular kids. And it was effective.

There are a lot of people saying, "Go



"There's no way of knowing which kids will need what skills. Imagination, resourcefulness, and high intelligence are not the preserve only of the wealthy."

back to the basics. There's only one pedagogy, that's grinding it down. Warriner's grammar for all." But unless we get the kids' attention, unless the incentives are right for those *particular* kids, we won't persuade them to learn.

We have to teach in different ways with different kids, particularly the demoralized. We can't just say, "You should be interested in the life of the mind, therefore you will now read *Ivanhoe*." We need to come at it from different angles, different directions.

We can never stop trying—that would be a waste of intellectual resources, the minds of young people. There's no way of knowing which kids will need what skills. Imagination, resourcefulness, and high intelligence are not the preserve only of the wealthy. A lot of poor kids, maybe now semi-illiterate, are in fact very, very talented. Unless we make it possible for every young person to have a shot at showing off, at achieving, we won't know who can.

Sure, a lot of kids are going to live very dull lives, at least by our values. We hope they're happy lives, but they're going to be dull. The question is, how do we collectively—how does society—decide which lives we'll each live? The answer is, we must eliminate to the greatest possible extent influences on each of our decisions that are unfair. We should push every kid as though that youngster were going to reach the moon.

And we should do so knowing full well that some kids will say, "I need to add and multiply and subtract and divide but beyond that, everything's dull. I'm *never* going to use any more math." For a lot of people, that's true. They won't even use percents—alas, they'll be conned by the bank. But for others, more advanced work will be essential. And no one knows which will be which.

Society categorizes all the time. If a person is black or Hispanic and poor, that person is a service worker. It's a self-fulfilling prophecy. And some of the kids start believing it. I remember working with a girl from Baltimore who came to an intensive program at Andover Short Term Institute saying that she was going to become a practical nurse. She left saying she was going to be a physician. The last I heard, she was a full scholarship student at Goucher College. Six weeks with a science teacher completely redirected her sense of herself. She was miserably schooled, but look where she is now because that physics teacher saw something special in her.

All this will be a very hard job because many young people don't see much in the system that rewards them or their families. Why play the game if the rules are stacked against you? And what do we tell a low-income black kid these days, "Shoot for the stars"? The kid will say, "Who are you kidding?"

Is that the key thing, though, not categorizing students? There are no panaceas. But if there is one idea that seems to be very persuasive, it is the elimination of anonymity.

Truancy in good elementary schools is very low. One obvious reason is that the students are little kids, but another reason is that these youngsters are known as *individual* people. There aren't big classes, so when Johnny is absent, Mrs. Jones knows who Johnny is, knows where Johnny lives, knows Johnny's younger sister, goes and finds Johnny's younger sister: "Where's Johnny?"

And if Mrs. Jones is really aggressive, she trots down to the local game emporium, grabs Johnny by the ear, and drags him back. In the high school, with 125 kids or 150 kids or 120 kids to be responsible for, the teacher doesn't know many individuals. Their sisters? C'mon. Where they live? Too much.

Many high school students are anonymous in their schools. They can drift. And they feel that no one cares. If we can change the high schools to get the anonymity down, then we will have a fighting chance. This is what many of us who want to reform the schools are saying.

The trick, then, is how to get those ratios down without increasing budgets. The trick is for people to be prepared to make the necessary compromises to eliminate anonymity. It can be done.

But when you're dealing with a demoralized student who has been around schools for nine years and hasn't picked up the skill of reading, how do you teach that person? Slowly, patiently, and with great difficulty. We're dealing with a very wounded person.

The humiliation of not being able to read is why a lot of kids fake it. They're very clever at faking it. They'll look at the picture and guess. And you and I would be the same way. When we go to a foreign country and forget the language, we fake all over the place.

This makes teaching exceedingly difficult. One-on-one usually works best, or one-on-two. Often, the only people who can get through are peers, a sixteen-year-old teaching another sixteen-year-old.

We know a lot about how to do it. It's just that it's very expensive. It takes a lot of "people time". And that "people time" is spent as much in dealing with the damage to self esteem and with the demoralization as in getting the student to read.

It's not as expensive as dealing with them the rest of their lives. Have you got numbers on that? Various people have computed such costs. But that argument involves long-range thinking. It's like lowering the national debt: people say, "We just won't talk about it now." The same reasoning is applied to education: "We'll cut the funds and not talk about the costs in frustration." The country just doesn't want to hear. We've lost our faith in investing in the future.

Our illiteracy rate is rather high among civilized nations, isn't it? A fifth of Americans are essentially illiterate. Some, such as Jonathan Kozol, argue that the number is even higher—a third. Ironically, many of these illiterates have high school

diplomas. Again, we're so enamoured of the symbol—graduation exercises, the diploma—we've lost track of what it's supposed to mean. So we allow the school machines to run: People move and go to class, to ninth grade and tenth grade—even though they can't read. The truth is so painful we can't face it.

Should we go with the flow and simply turn our colleges into high schools? And our high schools into grade schools? I think a lot of colleges *have* to be high schools. I don't think we should ever give up on a youngster. We can't say, "Well, this kid's illiterate, so we should stop teaching him because he's unworthy of our attention." If illiteracy is what the system produces, we must teach basic English in the junior year of college, and that's what's happening. We can't just give up.

You say there are no panaceas. But some people argue that our high schools should simply have higher standards, and they point to Japan and Europe. Are their standards that high, or is it apples and oranges? It's partly apples and oranges. It's partly that in some cultures there is more societal support for abstract academic learning than in others. If I were to pick the parents for the ideal high school, many might be Asian.

I'm not sure how closely we should be looking at Japanese and European models. As far as many of the problems of American schools go, we don't need research at all, we just need to be able to add and subtract and multiply. If we want a teacher to spend five minutes a week with each of 175 students, we multiply 5 by 175 and we divide by 60, and the result is, of course, an absurd number, a block of hours that few teachers can invest. And just for *five minutes a week* on a particular student's work!

Until we get those numbers down, let's not talk about assigning two pieces of writing a week. We don't have to cross the Pacific to realize American high schools have a problem—or to find a solution.

An Uncompromising Position: High Schools Must Change

The current criticism of America's high schools is not, of course, unique. "Since the 1930s," writes Theodore Sizer in a 1983 report published by the National Association of Secondary School Principals (NASSP), "American education has experienced a series of cyclical reform efforts, each about a decade long." Sizer divides each ten-year period into phases: initial outrage, the formation of commissions and task forces, reports and recommendations by those groups, adoption of some of those recommendations, and relative tranquility—to be shattered by fresh outrage, inaugurating the whole process once again.

In 1985, the United States should reach the end of the reports and recommendations stage. Two major reports—*High School*, sponsored by the Carnegie Foundation for the Advancement of Teaching and written by the foundation's president, Ernest L. Boyer, and *A Nation at Risk*, the report of the National Commission for Excellence in Education—have already been presented.

Horace's Compromise is the first of three books which report on a "Study of High Schools" co-sponsored by the NASSP and the National Association of Independent Schools. A second book, *The Last Citadel* by Robert Hampel, will be a historical survey of American high schools since 1940. The third book, like Sizer's an outgrowth of time spent observing American high schools, is *The Shopping Mall High School* (to be published in August 1985 by Houghton-Mifflin).

Of the many reports published thus far, few have been labeled "radical" as often as has *Horace's Compromise*. "The most far-reaching blueprint for change," said *Newsweek*. "A drastic reorganization of the curriculum and school day," said *Time*. What is radical about Ted Sizer's "imperatives for better schools"? Here are some of his recommendations:

Education should be decentralized, allowing each school to adapt to the needs of its particular students. High school should be voluntary—students who demonstrate a minima of basic literacy and mathematics skills are free either to leave school or to enroll in high school. In high school, they should be able to progress at their own rates, graduating when they have exhibited mastery of the school's requirements, whether that takes two years or five. Age grading and days divided into six or seven 50-minute periods, with each subject taught in a different block, should be abolished, in favor of a curriculum organized into four large areas: inquiry and expression, mathematics and science, literature and arts, and philosophy and history.

Sizer admits that these new schools will be "messy," and that they fly against the American passion for order: "Our schools have a passion for predictability. System plays a big role; spontaneity is frowned upon. High schools are very complex places because a lot of things have to go on in the same place."

The writers of *The Shopping Mall High School* also claim that the system can get in the way of education. Arthur G. Powell, David K. Cohen, and Eleanor Farrar took their shopping mall analogy from a high school guidance counselor: "Both types of institutions are profoundly consumer-oriented. Both try to hold customers by offering something for everyone. Individual stores or departments, and salespeople or teachers, may try their best to attract customers by advertising appeals of various sorts. Yet in the end the customer has the final word." And quite often that customer decides not to buy. There are specialty shops—college prep, special ed programs, gifted programs, vocational tech, and so on—but there is nothing "special" for the "average" student, many of whom end up "hanging out" in the high school, much as they do in the real mall after school.

It's a depressing thought, but like Sizer and the authors of the other reports, Powell and his colleagues see a ray of hope: It might be possible to launch "a new, unusual, and long-term marketing campaign: to sell skill in using one's mind as a serious life skill. That is one of the few products the shopping mall high school has not tried to mass market. But it is not inconsistent with the mall at its best; it simply takes things one step further toward the day when different specialty shops, all committed to maximizing intellectual potential, will exist for nearly all teenagers instead of just for some of them."

HIGH SCHOOL NEWS

A plethora of national studies has made high schools front-page news. Here are reports on more specialized research, on colleges and universities forging new links with secondary schools, on the "competition" with Japan, and on the impact of computers—plus comments from the classroom: high school teachers voicing criticism and praise.

Teachers On Raising Standards

Kathleen Webb, Hartwick '67; guidance counselor at Lely High School, Naples, Fla., for the past 11 years:

"Florida is trying to lead the nation in upgrading academic standards. The requirements for graduating have gone sky-high; 26 credits now instead of 20, seven 50-minute periods a day until four o'clock, with no study hall, and a state test in basic skills. Those requirements are reasonable for some kids, but unreasonable for others; to some extent I think the standards are equating quantity with quality, and everyone's getting burned out.

"The requirements are heading in the right direction, but so quickly that we aren't giving the kids time to adjust."

James T. Hepinstall, RPI '33; retired in 1975 as superintendent of the Albany, N.Y., school system, where he had been teacher and administrator for more than 40 years:

"Lately, I've seen more intense requirements for diplomas being pushed by those with money and power, and in a lot of ways, that makes sense. But what about the kid in the ninth grade who's reading as if he were in the sixth? Do we just let him go, or do we give him skills commensurate with his abilities? We know that a diploma is the key to a job, and in Albany, we've offered several kinds for years."

Robert Cross, Hartwick '59; social studies teacher for 25 years at Maple Hill High School in Castleton, N.Y.:

"I'd like to see more rigorous academic standards, with the teachers having more power to enforce them. The impression I get is that parents don't like to see their kids do poorly. Instead of focusing on the kid, they focus on the teachers as the source of the problem. Instead of calling teachers for conferences on the kid, they call the guidance office to find out what's wrong with the teacher.

"The implication you get as a teacher is that you're supposed to give everybody good marks. Don't fail anyone. As a result degrees don't end up meaning very much, because the students get through school without being held to learning anything.

"But I have a simplistic approach. I blame everything on Dr. Spock. He said, 'Don't stifle a budding ego; no one can be a failure.' That has carried over into academics, and as a result, there's been no setting of standards, and kids do end up as failures.

"I'd rather have taught in an earlier day when the students who couldn't make it were allowed to drop out. Admittedly they can't do anything now without a diploma, because they'll end up unemployed—but now we keep them in school, and they still end up unemployed."

Jerry Dyer, Hopkins, MA '83; he is in his first year of teaching English at Loyola High School in Towson, Md.:

"Even among the good students, the system doesn't teach the value of independent thinking; education is meritocracy-based: You need grades. Kids want to know, 'Is this going to be on the test?' It's almost a materialism of the intellect; rather than having intellectual skills, education is having these measurements that you flash in front of people to get a job or impress them. Measurements need to be devalued—but not achievement."

Sister Christopher Pixley, RPI, MS '75; a Dominican Sister of San Rafael, she is principal of the St. Vincent Ferrer High School in Vallejo, Cal., and has taught math and chemistry for 23 years:

"We need to have high expectations for our students, but we also have to accommodate our school system to the learning styles that students have, because that's the only way to reach the students we're losing. You can't just raise standards across the board. You have to demand that each student strive to the limit of his or her potential, whether on the remedial or honors level. It's been shown that students do best when demands are put on them, so the question is, how can we do that for the ones we're in danger of losing? It's a tall order."

Just Friends? Students in School

Walking past a knot of laughing, talking teenagers, you can often sense the power of a peer group. It's a power, says sociologist Joyce Levy Epstein, that can be made to work for the high school. But first, the school must realize that it has the ability to influence students in their choice of friends. "Friendships can't be engineered," says Epstein, "but the conditions which yield friendships can be put into place."

Students make more friends, and more friends from diverse backgrounds, in what Epstein and colleagues call high-participatory schools. Unlike more traditional schools, where the underlying assumption is that students working together will lead to students talking together and then to general unruliness, high-participatory schools encourage student interaction. With many types of assignments and projects, students move from group to heterogeneous group, and teachers reward group achievement. (In a traditional classroom, there are usually only a few, easily recognized individual "stars" or "pets".)

Eliminating or limiting academic tracking, making room for extracurricular activities during the schoolday (so students who work after school won't be automatically excluded, for example), and opening such activities to people at all skill levels are other ways a school can encourage broader contacts.

In such situations, says Epstein, a researcher at the Johns Hopkins Center for the Social Organization of Schools, students tend to make friendship choices that are more "egalitarian." Because they are given a chance to recognize others' special skills, they are not limited to choosing friends on the basis of externals—which often means picking friends much like themselves. In fact, admits Epstein, a student's two closest friends are likely to be fairly similar even in such a high-participatory setting, but it's at the next level, from the third-best friend out, that the broadening influence is felt.

Why bother? First, the school may feel it has an obligation to support society's commitment to diversity: "Take the example of desegregation. It may be the school's responsibility to arrange that black and white students meet in a positive way." Another example: "It may be the school's responsibility to see that kids have the opportunity to know that even though some kids have lesser academic abilities, they have talents."

Some schools, she says, balance the need for diversity and for different paces of instruction by having academic tracking only in certain courses and making others as heterogeneous as possible. A total commitment to academic tracking may widen the already large gap between high- and low-scoring students, partially by separating those students: Having high-scoring friends increases the achievement of both low- and high-scoring students.

High-participatory schools, Epstein points out, also do a better job of holding their students' interest. While students' satisfaction with other schools drops as they go from Grade 9 to Grade 12, the interest level for students in high-participatory schools stays constant. —MRY

A Population At Risk: Dropouts

With standardized test scores declining and the education page of the *New York Times* wondering why Johnny can't read (or write, or add, or even make it to class), the consensus among educational movers and shakers in the high schools has been: We're not working them hard enough. Back to the basics, say the National Commission on Excellence in Education, the Education Commission of the States, and the Task Force on Education for Economic Growth: a core curriculum of English, math, science, social studies and language, with more homework and tougher grading standards. Some educators are calling for longer school days and calendar years; a few have even suggested a longer school *week*.

All well and good, since studies have shown that smart kids get smarter when pushed. But a new study, prepared for the American Educational Research Association (AERA) by sociologists Edward McDill and Aaron Pallas of Johns Hopkins and Gary Natriello of Columbia University Teachers College, warns that students who are less academically inclined may get trampled underfoot in the stampede back to excellence.

"If academic standards are raised and students are not provided substantial additional help to attain them, it seems plausible to expect that socially and academically disadvantaged students will be more likely to experience frustration and failure," the authors declare in *A Population at Risk: The Impact of Raising Standards on Potential Dropouts*.

The study ultimately walks a middle line between what it identifies as the two major trends in high school education over the past 30 years: excellence and equity. In the post-Sputnik era of the late 1950s, America was in a fever to be the best, and the National Defense Education Act of 1958 improved programs and facilities in the public schools. With the Civil Rights Act of 1964 and President Johnson's Great Society Program, the schools' focus shifted from quality to equal opportunity; critics have blamed the shift to equity for the subsequent erosion of academic standards and performance.

"We don't want to roll back the accomplishments of the last decade," says the AERA study's co-author Aaron Pallas, an associate research scientist in the Department of Sociology at Hopkins. "I think the crowning achievement of schools over that time was the opening of doors to minorities."

The study notes that dropping out is

already a problem of epidemic proportions. Research in 1979 showed that some 25 percent of all 18-year-olds weren't graduating from high school (on the other hand, the U.S. and Japan led the industrial world in percentage of young people *entering* high school), and a 1972 report to the U.S. Senate estimated the yearly economic impact of the attrition rate: $71 billion in lost tax revenues from high school dropouts between the ages of 25 and 34, $3 billion in welfare and unemployment assistance, and $3 billion in associated crime prevention.

The AERA study says that dropping out stems from problems which tougher standards are only likely to aggravate. "By far the most common reason for leaving school is poor academic performance," say the authors. "It is not surprising that students who are not doing well in school should seek to leave an environment providing negative feedback." In other words, nobody likes to feel stupid, and under a back-to-basics curriculum, the non-academics may have even less room to shine.

Similarly, demanding more of the borderline student's time may be like trying to get blood from a stone. The average U.S. high school student spends "more time watching television per day than doing homework per week," but not the potential dropout. He or she has often "taken on the attitudes and roles of adults while still in high school," including "the work role." Among twelfth-graders, for example, those who work average 15 to 18 hours a week. And each year there are 400,000 adolescent mothers under the age of 17, 80 percent of whom never finish high school. The point is that many dropouts and potential dropouts already suffer from conflicting demands on their time.

So what's the answer? It's still "excellence," but with a safety net for the at-risk population. Pallas and colleagues suggest some modifications in the educational environment, none of them very surprising, that could keep the potential dropout from being pushed over the line by higher standards: smaller schools, with lower student-teacher ratios and the flexibility to gear programs to individual needs. At the same time, good old-fashioned rules, with the emphasis on clarity and consistency, are also "crucial to high academic achievement," no matter how specialized the curriculum. And school "climate," an atmosphere of "support for achievement and intellectualism," is important, too.

Laudable aims, but the fact is that it's a lot easier to institute reforms on paper than to legislate them in the classroom. "Most teachers have their own definite ideas about what will work," says Pallas. "At every step there's the risk that someone will say, 'Forget this stuff, I'm going to implement my own ideas.' Programs should be closely evaluated at the same time that they're being put into effect."

Even if all teachers follow the same game plan, evaluating the success of a program is tricky. Once more challenging standards are in place, it's likely that overall student achievement will rise. But, argues Pallas, it's also likely that many borderline students, if they aren't helped

to meet the new standards, will drop out. Since the students being tested will be the "survivors," rather than what Pallas calls the "full enrollment model," the reformers should not be too quick to take credit for higher performance. To get a truer estimate of the efficacy of higher standards, the researchers say methods should be found to include dropouts in the performance measures.

It's a way, they say, of keeping equity, as well as excellence, in mind. —JL

Computer Caveat

Schools are buying computers so rapidly that no one knows how many are now in American classrooms. One thing we do know, however, according to researcher Henry Jay Becker of the Johns Hopkins Center for the Social Organization of Schools, is that schools are buying computers without really knowing how to use them most effectively.

In a survey of U.S. principals and teachers (another survey is in progress), Becker was able to draw some conclusions about patterns of computer use in schools. High schools are the largest users. By January 1983, 85 percent of all high schools had at least one computer, compared to 42 percent of elementary schools.

Most high schools used their computers to teach students how to program. In fact, the longer schools had had the computers,

the more likely they were used to teach programming. That's perfectly understandable, Becker says, because educational software is notoriously bad and little has been done to integrate computers into the traditional curriculum or to apply computers to traditional classroom activities.

It's nonetheless disappointing that schools are making such limited use of computers, Becker says, and the solution goes beyond simply putting more and more computers into the schools. Becker is one of a growing number of educators who is recommending that schools stop buying computers for the moment, until more research is done about how to use them. "I'm personally a really avid computerist," he says. "But at the same time I spent enough wasted time in my crazed period so that I can safely say that schools shouldn't feel they have to do something

Misguided Efforts: College Counseling

For six out of 10 high school students in the United States the next step is college. But often that step is a misstep: six out of 10 students enrolled as freshmen at a college or university fail to graduate from that institution.

Why do so many students pick the "wrong" school? The answer, suggests the National College Counseling Project, can be found in inadequate college counseling. In the spring of 1984, the project's researchers surveyed guidance counselors at 2,200 of the nation's 25,000 high schools. (Of those counselors, 51.8 percent returned their questionnaires.) This is what the researchers found:

Schools serving upper-income families provide the best college counseling services. The disparity is likely to get worse: over the past three years, one in five lower-income schools (where family income is less than $15,000) has reduced its college counseling resources. So poorer students, who can expect the least help in college counseling from their parents and friends, are also the ones who can expect the least help in school.

Regardless of the income group a high school serves, one factor is constant. Almost all counselors—99 percent—report that their programs are somewhat or very effective, despite the fact that few schools ask for feedback from students (35.7 percent) or parents (15.8 percent).

While the counselors rated their overall efforts highly, some anxieties showed up when they filled in the questionnaire's Comments section. Many mentioned the high ratio of students they have to serve or complained of too much time spent on non-counseling duties. "I didn't earn 80 credits in counseling," one person told the researchers, "so I could sit here and figure out how many kids can take Phys. Ed. in third period."

"College counselors don't do the things people think they do—and they haven't done them for a long time," says Project

Director David Erdmann, director of undergraduate admissions at Rensselaer Polytechnic Institute. "Sitting down with the student, doing a thorough inventory of his or her strengths and weaknesses, and matching up a list of colleges and universities with those—that doesn't happen very often, except in private schools.

"We talked to a lot of students," says Erdmann, "and when asked how much time they spent with their college counselor in making their choices, the answer was often 'very little time' or 'no time'."

Even when counselors find time for the matching process, says Erdmann, it can be self-serving: counselors want students to get into "good" schools, so "the matching process tends to be reputationally driven rather than institutionally driven." Also, suggesting possible schools is essentially subjective: "A good counselor in one school could sit down with a student, inventory strengths and weaknesses, and come up with a list of 10 schools. Another good counselor at another school would have 10 different schools on the list."

Erdmann, who describes himself as a former, "barely adequate" high school guidance counselor, says the project isn't out to condemn high school guidance counselors, but rather to suggest better ways of doing a difficult job.

To that end, the researchers are following up the survey with visits to U.S. high schools, selected to represent a cross-section of regions, incomes, affiliations, and so on. From this closer look, they plan to publish a formal report, complete with recommendations, this fall. Later in the 1985-86 school year, in the project's fourth and final stage, members will visit 20 schools across the country to help counselors set up the new guidelines.

Erdmann already has some suggestions: "College counseling can, and should, be a matter of establishing a process students can work through themselves. It doesn't have to be on a one-on-one level." The ideal program, he says, is one which "educates students about decision-making skills."

When university or college representatives visit a high school, Erdmann would like guidance counselors to request "a form of tithing" from the visitors: "Don't just let them sell their college. They should also be willing to give X percent of their time to educating students, for the good of colleges in the larger sense. They can talk to the students about writing an efficient essay, about what an interview really means, about what to look for when they visit a college campus."

The declining number of 18-year-olds means that "colleges are going to recruit more aggressively," says Erdmann, "therefore it's an imperative that kids learn how to deal with that flood of information." In short: "Good counseling is not coming up with a list of schools and handing it to a student. It is having a student go into the matching process in a scientific manner, not simply following the path of least resistance."

Did the survey turn up any surprises? "The economic disparities," says Erdmann. "It's not really surprising. But is it what we want to have happen?" —MRY

about computers even though they don't know what they are doing."

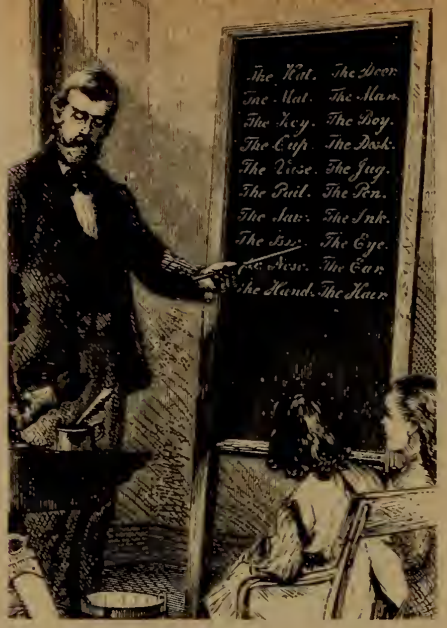
What then should be done? Becker thinks what's needed is an "experimental attitude": "Small numbers of schools should be given sufficient equipment to put computers in the classroom and try to use them in different ways."

Leaders in school districts, or teachers in very large schools, could find areas where the curriculum is weak and apply computers to make it better—more understandable and more fun. They would need the support of the school or school district, so that they could get their hands on all the computer resources needed, maybe even moving all the computers from a school district to one classroom. They would collect available software, or perhaps write their own. They would devise ways to integrate the computer into the normal activities of the classroom—lecture, demonstration, discussion, exercise. And then they would set up a controlled experiment in which one class got the computer-assisted course and another the regular course. Then they would measure the impact on achievement—math or science scores, reasoning and writing ability, or whatever.

Until researchers begin to test different uses of computers in the classroom, Becker says, schools won't know what uses are educationally cost effective. There have been studies of using computers for drill and practice, for instance, and they "seem to show that if you compare students who use pencil and paper with those who use computers for mathematics drills, computers are at least as good as pencil and paper. But if you think of the expense, computers should be much more effective."

—ECE

Teachers On Teaching



Paul Lambert, Hartwick '55; superintendent of schools, Cooperstown, N.Y., for the past nine years, he was an elementary school principal for nine years and has taught high-school social studies and history:

"Change has to begin in the classroom, with realistic standards and well-trained, caring teachers. Yes, that does mean finding a way to pay our teachers better salaries. If you had to choose between four years of college to get a starting salary of $11,500, or a three-month tractor-trailer training course that would start you at $20,000, why would you even look into teaching?

"We certainly can't recruit the best people with the starting salaries we're offering. The industries are gobbling up the math and science teachers."

Mary Ann Dunevant, Hopkins, MEd '79; has taught English for 11 years at Archbishop Keough High School, Baltimore, Md.:

"I'd like to see more of the good teachers stay in the high schools—especially at the age that I am [32], a lot of people are getting out because they don't see teaching as a career with a future.

"What would keep them in the schools? A fair salary. Support from their administrators—perhaps having the administrator occasionally teach a class so there's not such a difference between teachers and administrators."

Lloyd A. Kelley, Jr., RPI '52; superintendent of the Rutland, Vt., city schools, he has held many teaching and administrative posts, including a stint as commissioner of education for the state of Vermont:

"We're working here toward what we call 'mastery.' We feel that any student, given the appropriate time, materials and staff can learn what you expect of all students. That *doesn't* mean you can make a silk purse out of a sow's ear. It simply means that students at a given level should master the core of knowledge that's been prescribed for them.

"This gets you into a competency-based education, where you are constantly re-assessing students and re-teaching them. ... The role of the teacher changes from the imparter of cultural heritage to a mediator of instruction. ... I favor the concept of a master teacher working with a group of teachers and instructional aides. This decreases the student-teacher ratio, which always means more money, but it creates more sophisticated, individualized classroom planning. We need to make that investment.

"I'm very fearful that secondary education is more a case of providing skills for the present that worked in the past, rather than a case of providing skills for the future. For too long, our educational planning has been reactive rather than prospective."

Mike Brown, F&M '70; computer science and physics teacher at the Kiski School in Saltsburg, Pa., he has also taught at the Friendly High School in Prince Georges County, Md.:

"I'd like to see greater professionalism among the faculties, and that isn't going to happen until the school boards start treating us like professionals. School boards and administrations treat teachers the way that teachers treat students: they act as if they know best. Teachers *do* know better than students; for instance, I know better than the kids what I should be teaching in my physics course. But everyone on the school boards thinks he or she knows how to teach, and it simply isn't the case.

"Teachers are put in a factory assembly-line situation, where we're not involved in the decision-making. In a factory they don't expect the assembly-line guys to say 'hold it, I think we oughta do it like this.' They expect them just to be cogs in a wheel."

Timothy C. Doyle, F&M '73; teaches American and Russian history and Russian language at the Lawrenceville (N.J.) School:

"It's tough for me to comment on the public schools because I've never worked in them but my perception is that private school kids do a lot more homework. Also, I don't think public school teachers assign much writing, because they don't have the time to read it. Their classes are too big. The average public school teacher carries, what, a load of 60 to 100 students? I've got 40 to 50 tops where I am."

Can U.S. High Schools Learn from the Japanese?

High school in Japan is not compulsory, but even so 95 percent of the nation's young people enter high school—the same percentage as in the United States. And Japanese students enter high school already well prepared—the nation's 13- and 14-year-olds outscore students worldwide on math and science achievement tests.

"The average Japanese high school graduate," estimates Thomas P. Rohlen in *Japan's High Schools* (University of California, Berkeley: 1984), "has the equivalent basic knowledge of the average American college graduate." When the longer Japanese school year (240 days) is taken into account, at the end of 12 years the Japanese high school graduate has actually had four more years of schooling than his U.S. counterpart. And that's not counting the time spent at *juku*.

Juku are after-school "cram" schools, preparing students for the annual competitions, known as "examination hell," which determine entrance to the nation's universities—and more. Getting into a top school is the most important step toward a prestigious job: The top level of the government, for example, is dominated by graduates of Tokyo University; the statistical chances of a student entering Tokyo University are about 1 in 440.

Not everyone, of course, tries for entrance to Tokyo University. In fact, says Merry I. White, a Harvard sociologist specializing in Japanese education, "The Western perception of examination hell is a stereotype. Really, only 10 percent of high school kids go through the worst of

that." White points out that the competition for entrance into a good high school—public or private—may be even more intense: "If you want to go to a prestigious high school, you must take an entrance exam." So there are *juku* to prepare students for the high school exams—there are even *juku* which admit students by examination.

Although schools are ranked and entrance is competitive, White says that the premise behind the Japanese system "is still egalitarian, *i.e.*, intelligence and the ability to take tests are what counts. Super-bright kids make it even if poor or badly connected." The scales can be tipped, she concedes, in the case of "the middle-range kids, who need motivation, stimulation. That's where parental investment of money—for after-school programs or a tutor—or of time—as when mothers work with their children—can help." And, as John Zeugner, a Worcester Polytechnic Institute professor who has written on Japanese education, notes, money can be a help: "Certain schools with good rates of getting people into universities charge astronomical fees."

Sounds like a rat race? The situation for high school students (boys are more likely to aim for the best universities than girls, many of whom go on to junior college) isn't as bad as it may appear, argues White. "The student facing the exam has a lot of people on his side—mother, family, teacher—against the exam, which is seen as an outside enemy. Obviously, a lot is at stake, and if you fail, you're very upset, but there's something *integrating* about the pressure."

What about the relatively high rate of suicide among Japanese teenagers? "In Japanese culture, suicide is not viewed as as extreme an act as it is in the United States. It is viewed as a mode of self-expression, so there's a precedent," White notes. "When suicide happens, it usually involves a family dynamic which isolates the child rather than external pressures."

To the Japanese, the biggest problem facing their high schools—and junior highs—is school violence. "One education official has said that such episodes are clearly the fruits of the American occupation after World War II," says John Zeugner, "when Japanese schools were reorganized on the American model." What the Japanese mean by school violence, however, may seem child's play compared to school violence in the U.S. Although there have been (highly publicized) cases where teenagers have attacked or killed parents and teachers, the numbers involved are very small. "Violence has a different cultural meaning," says Merry White. "A listing of violent episodes includes such categories as whether students have committed an act of violence against the required school uniform [meant to promote egalitarianism] or have dyed their hair. And, again, it's a matter of scale—the crimes reported in one year among school-age children in Osaka, for example, are equal to those reported in one day in New York."

The biggest difference between Japanese and American high schools may be the national consensus in Japan on the importance of education. The value placed on education shows up in the status and pay accorded teachers: "Teachers are hired for life," writes White in *The Public Interest*, "at starting salaries equivalent to starting salaries for college graduates in the corporate world."

Does the American system do anything better? In *Japan's High Schools*, Thomas Rohlen suggests that Japan, with its common, fast-paced curriculum, falls short when it comes to the slower learners: "Those who leave school after ninth grade, and the small percentage who drop out of high school, face problems far more severe than those who stay to face the exam competition." —MRY

High School Index

Percentage of Americans aged 25 and older who had completed four years of high school in 1982: 71

In 1910: 13.5

Percentage of U.S. students enrolled in the general—rather than the academic or vocational—track in 1980: 37

Twenty years ago: 12

Number of minutes in the average U.S. class "hour": 57

Minutes of that hour spent on administration: 12

Of 19 academic tests given to students in industrialized nations the number of subjects in which the U.S. scored highest: 0

Second highest: 0

Lowest: 7

Of the six tests Japanese students took, the number in which they scored highest: 3

Percentage of U.S. students with jobs: 67

Percentage of Japanese male students with jobs: 18

Of female students: 11

Of 100 U.S. high school seniors, the number who own their own car: 50

Of 100 high school students in Japan, the number who have a driver's license and access to a car: 1

Number of hours the average U.S. student spends on homework per week: 3.9

The average Japanese student: 15

Percentage of U.S. parents who said in 1969 they'd like their child to be a public school teacher: 75

In 1983: 43

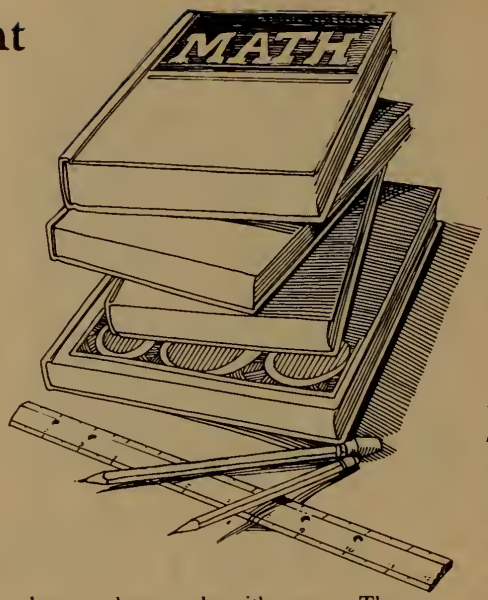
Percentage of decrease in real terms of U.S. teachers' salaries between 1972 and 1983: 12.2

Percentage of U.S. schoolteachers who report feeling unsafe on the job: 35

Average SAT scores (combined) of a National Merit Semifinalist: 1450 out of a possible 1600

Of U.S. college-bound students in 1982 who intended to major in education: 813

Teachers On What's Being Taught



Diane Jacobs, Hopkins, MLA '73, Hopkins doctoral candidate in gifted education; on sabbatical after 12 years of teaching English at Pikesville (Md.) Senior High School:

"I would like to see more career education in the high schools for students of all ability levels—career education beginning in ninth grade, with the purpose not of having students seal themselves into a career for life, but with the purpose of offering diversity of options and aspirations.

"Mentorship for high school students would be a great benefit in learning about career realities. It's a good experience for students to see that things are not just within four walls, that what you do in high school matters."

Kathi Fragola Hochber, Hartwick '73; French/Spanish teacher and soccer coach at Harrison (N.Y.) High School:

"We need some kind of national continuity in the writing of syllabi, in each subject area. I get kids in my language classes from out of state, and they're either too far behind or too far ahead. It would be good if we could even get some continuity within the state.

"Maybe this doesn't hold true in all subject areas—I can't see a biology course in New York being much different than one on the West Coast—but with languages, there's often a big gap. Of course, that may have to do with money. The economic makeup of a community could determine the quality of its students, and also the amount of money it is willing, or can afford, to spend on language programs."

Thomas Zulick, Hartwick '61; math teacher at Saugerties (N.Y.) High School; he has taught for 25 years:

"We need to get back to the basics, the three R's. Kids can't read, they can't do arithmetic or logic. Everything else would fall in line if we got back to the basics.

"Grade values have gotten too political. Students and administrators aren't concerned about a core of knowledge, they're worried about averages."

Herman Finkle, F&M '50; guidance counselor at the Ewing High School in Trenton, N.J., he has worked 18 years as a guidance counselor and 10 years as a teacher with special education students:

"I think students need to have more of a liberal arts background in the ninth and tenth grades, and then a major for the last two years, the way colleges do."

Larry A. George, WPI, MA '78; principal, the Guilford School, Brattleboro, Vt.; he has also been a science teacher:

"We've got to reorganize the schools so that they're more student-centered than curriculum-centered. The amount of information there is to teach has grown to amazing proportions. In an information-oriented age, kids have to know where to find things and how, rather than a wealth of details.

"In science, for instance, there's a lot more to teach than simply facts. Kids need to know more about how science operates, how it affects their lives. We have to give them hands-on experiences, and make them relate the subject to the different kinds of things that are going on.

"Ted Sizer talks about doing away with the concept of separate teachers for different subjects in favor of, say, a combined social studies and language arts teacher. It's a more humanistic approach; in some ways it's like bringing a middle school environment to the high school level."

A Little Help From Higher Education

Now seems to be the time when all good colleges and universities are coming to the aid of secondary education. The long-term goals are altruistic; the short-term goals have to do with demographics. "Colleges are reaching toward high schools as student demographics are declining," says Dean Bradley R. Dewey of Franklin and Marshall College.

The current demographic dip is expected to curve back up in the mid-1990s, when the present baby "boomlet" comes of age. Meanwhile, the dip is forcing higher education to work with its counterparts in secondary education, says Dewey, and that's good.

Some programs focus on teachers, others on students or on curriculum, still others on combinations of those basic elements. The important factor seems to be matching an institution's expertise to what the high schools want. "You can't force things on the schools," says Peter Christopher, a mathematics professor at Worcester Polytechnic Institute. "The schools have to come looking. The trick is to come up with programs that appeal."

WPI has done that with its Frontiers in Mathematics and Science program. Aimed at academically able students, Frontiers offers material traditionally *not* covered in high school: current unsolved problems in chemistry, physics, mathematics, and biology. The purpose: to spark the participants' interest and thus counterbalance the national decline in the number of high school graduates who wish to major in science or mathematics. At the same time, the two-week program introduces WPI to potential applicants. So many students applied for the first tuition-free program (subsidized for the first two years by the George I. Alden Trust) that WPI upped the number of participants from 36 to 50 (65 attended in 1984).

Frontiers is one phase of a five-part program to include an honors workshop for science and mathematics teachers, regular discussion groups, visiting lectures by WPI faculty, and a scientist-in-residence program. WPI is also exploring collaborative efforts with a fledgling group in its area called SKIP—for School, College, and Industry Partnership.

In Troy, N. Y., the acronym is CETS, for Consortium for Educational Technol-

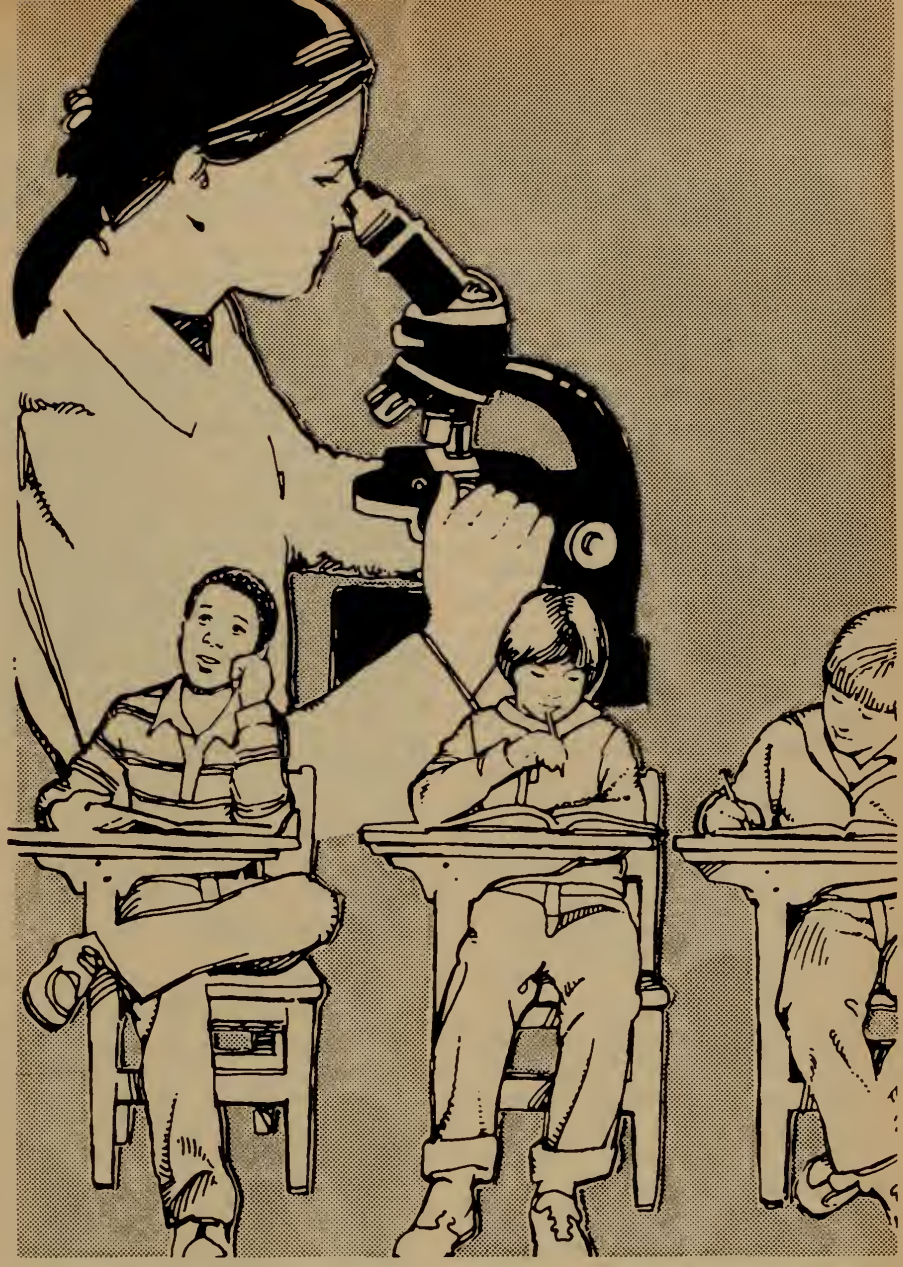
ogy and Science. Rensselaer Polytechnic Institute is among the institutions of higher education joining with high schools and industry to apply technology (primarily computers) to the teaching and learning of secondary school sciences and mathematics. The four-year project calls for summer workshops for research scientists and educators to produce and improve educational materials. It has lined up schools to try out the material—one by integrating it completely into the curriculum, the other by using it as a supplement.

While the project is making the grant-application rounds, RPI professors involved are going ahead on other work.

Mathematics professor Edith H. Luchins and colleagues have worked with the New York State Regents to revise the mathematics curriculum, used computer graphics to improve students' spatial skills, and set up an experimental reversal of the traditional order of science courses: physics first, then chemistry, then biology. "With this order," says Luchins, "students will be better prepared to understand the developments of microbiology, and the gap between high school and college biology will be much less."

The gap between high school and college courses, and the level of preparation the latter require, led 12 independent colleges and universities in Pennsylvania to issue a 1983 statement entitled "What We Expect." Those colleges have also initiated a series of humanities institutes for secondary school teachers—on literature in 1985, history in 1986, and foreign languages in 1987. They will be similar to national institutes once sponsored by the National Endowment for the Humanities: the faculty will be both professors and high school teachers, and the emphasis will be on content not pedagogy. But, says F&M Dean Bradley Dewey, "This attempts to be more than just a luminous summer experience—that glows very brightly for three or four weeks and then is allowed to stop." To encourage an afterglow of contacts between new colleagues, the geographic range will be narrow: each institute will really be four institutes—the colleges have divided Pennsylvania into four regions, and all participants at a given, centrally located institute will be from the same region. Funding for the first year comes from NEH, and several states, including Wisconsin and Florida, are interested in borrowing the concept.

Behind such projects lies the realization that it is high time to reforge the partnership between higher education and the high school. —MRY



Teachers On Responsibility

Lee C. Malbone, WPI, PhD '70; vice-principal at Burrillville Regional High School, Harrisville, R.I., since 1979:

"Parents have to monitor their children's behavior in high school, they have to communicate better with them and with their teachers. They have to emphasize the importance of education, and get re-involved in the process."

Charles W. Connolly, WPI '64; principal of the Classical High School, Lynn, Mass., where he has been a teacher and administrator for 25 years:

"I'd like to see education removed from all political interference. The people in power have too much control, financial and otherwise, over the education system. . . . The fact is that the schools here have been underfunded for the past five years. The teachers haven't had a raise in four years. That makes for poor morale, which inevitably gets transmitted to the kids.

"I also don't have any say about the teachers who come into my building, and yet I'm held responsible for their performances. The school board chooses them, and there's a definite sense that we're not supposed to step on their toes. It makes it very difficult to run a school."

Teachers On What's Good About High Schools

Paul Lambert, Hartwick:
"We have some outstanding teaching going on. It's an exciting time to be in education, even with all the trouble. There are new tools, like high technology and, in New York, the new state regents plan—it's up to all of us to see how creative we can be in implementing them."

Lee C. Malbone, WPI:
"The teachers are our biggest strength. Most of them are working together with an amazing dedication to the education process."

Mary Ann Dunevant, Hopkins:
"I find a renewed interest in learning. I'm not sure of the source—sometimes I think the students feel they have to get good grades to get into a good college, but for many students it is wanting to do something well and having a sense of satisfaction out of doing something well. taking pride in what they're learning to do.
"Teachers are encouraging excelling more, not accepting substandards."

Lloyd A. Kelley, Jr., RPI:
"Today's public school kids are learning what I learned in college. They're better trained than any generation in the history of this country."

Jerry Dyer, Hopkins:
"The way high schools are set up, students come into contact with different teachers who can influence them, show them values and content. A lot of schools and teachers try to present a plurality of views; they don't just teach to student interests, but also teach against some of their prejudices and weaknesses. It can be very broadening.
"American education tries to be awfully broad—that's good, although it can go too far and become a smorgasbord, a K Mart of the soul—whereas in other countries, you are channeled into a particular field much earlier."

Timothy Doyle, F&M:
"I'm not sure I see any great strengths, beyond the fact that there are many good teachers doing the best they can do with too many kids."

Robert Cross, Hartwick:
"The teachers."

Kathi Fragola Hochber, Hartwick:
"There's an incredible diversity of subject matter being offered to students, at least in reasonably affluent areas. By comparison, in France after a certain level, students have to decide to follow either an educational or a vocational track. Here, both are offered in the same system, and there's more flexibility to change."

Mike Brown, F&M:
"The faculties are our strength, trying to do their jobs in light of all the problems. Also, we're starting to get back to basics, and that's becoming a strength. It was necessary to go the other way for a while, and now we're swinging back."

Thomas Zulick, Hartwick:
"The increased use of computers has opened a lot of areas in teaching, such as TV home computers. Unfortunately, the computer will only do what you are able to tell it to do; you have to have the knowledge to put into it."

Herman Finkle, F&M:
"There are a lot of dedicated people in education, the majority of the teachers are excellent, but you don't hear too much about that, or about the good kids either. We could both use some positive publicity."

Sister Christopher Pixley, RPI:
"Diversity and plurality are our biggest strengths, but I don't think we support them very well. Of course, I'm somewhat biased, but the bulk of public support goes to public schools, and I think that's a mistake."

Diane Jacobs, Hopkins:
"The best thing about the public high school system is that it has a great potential for change. I really believe the great diversity of people who attend public schools, and their needs, can be heard. They have to say what they want, make their wishes known, but the public high school is a receptive climate, not rigid or closed to change. The community has to work for that change.
"The best thing about public education is the public. If the high schools are going to get better, it's going to have to be the people—and not just the people in the schools."

Jobs And High School Graduates

A high school graduate out to get a job is graded at the interview on personality, not transcript.

In 1983, a survey of *Fortune* 1300 firms asked executives, Are American educational standards high enough to help U.S. industry meet its foreign competition? Almost everyone agreed on the answer—no. In fact, the National Commission on Excellence in Education's 1983 report, *A Nation at Risk*, charges that the U.S. economic slump can be linked to the declining worth of a high school diploma.

But Robert C. Crain, of the Johns Hopkins Center for Social Organization of Schools, reasoned that executives aren't likely to be hiring for jobs requiring a high school diploma. He decided to question those who do the hiring. He figured that if the hypothesis were true, personnel managers would say they were having trouble finding well-prepared high school graduates and would be looking for the students who did well at the best schools.

Crain tried to bait his questionnaire so subtly the managers wouldn't know they were being asked: "Is American education any good?" Each questionnaire included a vignette of a representative hiring situation. There were 40 vignettes, varied along six dimensions, including type of high school. Since it's popularly believed that suburban schools are better than city schools, the bait was hidden in the vignettes. But managers didn't seem to pay attention to high school quality.

Since many high school graduates are hired for bottom-level jobs, quality of training in mathematics, science and literature can seem irrelevant. Of 1,390 personnel officers answering to the initial questionnaire, 52 percent said recent high school graduates have the reading and math needed, leaving 48 percent whose new employees presumably don't. Yet only 6 percent said they provide instruction in basic reading and math for workers, and only 2 percent said they've had to simplify the reading or math requirements of jobs because of workers' weaknesses.

What personnel managers look for first in high school graduates is dependability, followed by a good attitude. They also want someone who is moral (translation: "doesn't steal company equipment"). Just below these qualities come the ability to read (on the level of the daily newspaper) and to do basic math. —CEB

Inside the Education Crisis, and Why You Should Get Involved

By Charles M. Richardson '46 EE

A technologist turned teacher looks at education from the inside and describes what he sees from an engineering point of view: The system is worse than what has been made public. And the engineering-scientific community needs to take action.

So you're in a profession other than education, be it engineering, medicine, business management, law or whatever. Undoubtedly, you hear the laments over the educational "mediocrity," the SAT sag, the language lag, etc., and you say, "So what? With all that fussing, the educators will get more money in their budgets next year, and they'll take care of it. I'll do MY job, and they'll do theirs (with my kids). After all, THEY'RE PROFESSIONALS, RIGHT?"

Before *I* yell, "Wrong!," I'm asking *you*, the reader, to hang in there with me for a few lines from an engineer turned educator who has seen it from the inside. Then you may be ready to yell with me, and together we'll be heard.

In the last 14 years, I have dealt with more than 2,500 students on an individual diagnosis and prescription (mostly remedial) basis. I see at all levels—K–adult—the damaging effects of poor teaching and school management practices. I feel that most of my students would not be remedial had they been taught properly in the first place. All this has given me grave doubts about the ability of the educational system to heal itself without outside help (yea, even intervention), even with ubtantial ca$h tran$fuion.

Ponder for a moment the history of educational governance in this country—long-standing practices founded on the rationale that "Education is too important to be left to the educators." That philosophy has led to the educational supervision by lay boards of education and boards of regents from society-at-large, and the writing of education laws by legislators. Our most fundamental and far-reaching decisions about education are being made by non-educators.

However, Don Stewart, like myself an engineer turned educator, points out in *Educational Malpractices: The Big Gamble in our Schools*, that only 10 to 15 percent of U.S. schools are considered to be using effective teaching practices. Yet, most educational decision-makers outside education are urging decisions aimed at giving teachers higher salaries, merit pay, smaller classes, etc., with nary a word about improving the effectiveness of pedagogical practices. Who's really in charge here?

Simply granting more money to education has a poor track record: Make a logarithmic plot of the $billion$ spent on education over the last 30 years, and the $billion$ generated in the gross national product (GNP), extrapolate, and you'll get something like Figure 1. Thus if present trends persist, education will devour the entire GNP by the year 2063!

Ironically, from our runaway investment we are reaping galloping illiteracy: 18 million illiterate adults in 1970, 23 million in 1975, and *75 million* in 1983. Corporations are spending $millions$ annually teaching basic skills that should have been learned in public school. The Armed Services are re-writing manuals down to fifth-grade level, and half our youth don't vote and don't understand how our government works. It's no wonder that several states have already formed joint business-education "excellence" teams, most often chaired by a corporate CEO.

Persons outside education tend to assume that education operates as a profession, but I see much that persuades otherwise. It has ingrained practices of hypocrisy, fraud, conflict of interest, and ignorance of its own best research. The problem is one of technology, not in the sense of the use of technological products (e.g., computers), but of the basic technology of education itself: how humans learn. Educators have dropped their own ball, and the intellectual and political clout of our industrial/scientific community is needed to catalyze their recovery. From an engineering viewpoint, education needs a megadose of systems engineering.

The teacher training to which I was exposed included little discussion of developing an educational strategy on the basis of theory and evaluating the outcome of such; some material was downright misleading. In instructing student teachers, I felt coerced into participating in fraud by attesting to non-existent "competencies" in students I was teaching.

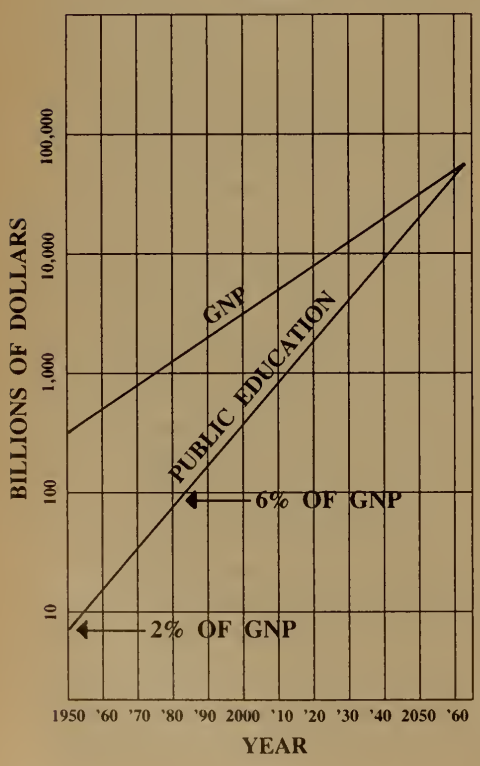
In the special-education field, the disconnection of theory from practice is even more bizarre: Dr. Gerald S. Coles's monumental research treatise on learning disability tests (*Harvard Educational Review*, August 1978) found NOT ONE test to have proven scientific validity for identifying something called a "learning disability," and that we are in effect "blaming the

"The solution to the educational problem is NOT more money, merit pay, teacher exams or the like, but better management of education."

victim for institutional failure." What's most alarming is that his paper has had *NO* effect: In the six years since its publication there has been not one serious rebuttal. But special-education "professionals" continue to use the tests to manipulate the lives of children and to assign them labels, supposedly in conformance with laws which call for scientific validation of tests used to determine access to programs.

It seems that too many educators ignore their own profession's best research. They tend to treat fervently held opinion with the same reverence as scientific fact, and have been doing so for so long that they have lost the ability to tell the difference! Such inadequate professional training accounts for the "mindlessness" which Charles Silberman describes in *Crisis in the Classroom* and for the frenetic flitting from fad to fad which too often upsets without upgrading, e.g., modern math.

Figure 1



Management of Skill Progressions

Improper teaching methods in the first grade start a chain of "connections" leading large numbers of our young to reading failure, frustration, illiteracy, delinquent behaviors and, too often, crime. Psychologists tell us repeatedly that learning is a joyful experience. The psychotherapeutic value of a successful learning experience has been praised as a "virtually unparalleled emotional discharge." Yet, this "success therapy" tends to be underestimated or ignored by the educational establishment.

Mismanagement of students' "time on task" and of their learning progressions (especially in the basic skills) has deprived far too many of the pleasures of learning. Experiences of failure bring on frustration and a poor self-image which can lead to maladaptive behaviors. Students become convinced that they can not succeed if they play by establishment rules, and so seek alternatives which bring them personal satisfaction, sometimes at establishment expense. Poor behavior is blamed for poor learning, but the chicken and egg relationship is mostly the other way around.

This line of "connections" would be purely speculative were it not for the existence of school districts managed by mastery learning systems, where increased academic success has been accompanied by dramatic decreases in discipline and vandalism problems! There are, as well, mountains of depressing data showing high rates of illiteracy in our prisons, and otherwise linking violent behavior with academic deficiencies.

In management parlance, the above conditions are a result of operating "open-loop," and bespeak the need to control quality (verify learning). Fortunately, an active, growing program is available as a model: the Network for Outcome-Based Schools (NO-BS—a cogent acronym!). It espouses a system for restructuring entire school districts to operate on a mastery learning basis. Its successes need to be brought to the attention of every school district, but it will still take an influx of management expertise and encouragement from other professions to effect meaningful change.

Reading: The Pivotal Issue

At the core of the problem is the controversy over how to teach beginning reading: phonics (letter sounds) first vs. whole-word memorization first. You may have heard educators say that it doesn't matter about the method "as long as the teacher is good," or they may advocate an "eclectic" method (a euphemism for a shotgun approach).

If children are first taught to memorize words by sight without identifying letter sounds ("sounding out," "decoding"), they are being conditioned that reading is a guessing game that depends on the teacher's telling them each new word. This approach confines children to a limited reading vocabulary (approximately 300 words in the crucial first grade) which allows only trivial and inane (See Spot run!) material to be handled.

On the other hand, if children are taught phonics first, they view each new word as a problem they can solve by recovering the spoken word from the "code." A problem-solving attitude is fostered early. A phonics-trained first grader can read about 2,000 words! [Some authorities put the number much higher.]

Let's review some of the other arguments so that you can be prepared to deal with them:

a. "Phonics instruction produces 'word-callers' who do not read for meaning." This is refuted by research (see below).

b. "English is too irregular." English is 85 to 90 percent regular. Several computers have been "taught" to read phonetically. The human brain is much more capable.

"Most people outside of education assume that, by and large, the educational system knows what it's doing and how to correct its ills if given more re$ource$$$."

c. "Reading is a psycholinguistic guessing game. A child should not be corrected if he reads 'house' for 'home' or 'pony' for 'horse' because he's 'reading for meaning.' "
d. "A child should be encouraged to guess an unknown word from context rather than sound it out. He can look at the first letter and then guess from the length and 'shape' of the word."

As a foundation for precise reading (c) and (d), above, are patently ridiculous, and a child with such for guidance can't distinguish between "form" and "from," nor can he be sure whether the boat contains a load of carp or crap!
e. "TV is to blame for children not reading." This is another chicken and egg argument: The printed word is a much better entertainment device than the bulk of TV fare, but children who lack confidence in handling new reading material will not attempt it as pleasure.

Even though you may think sounding out words is just plain common sense and nobody would do it any other way, there are thousands of teachers who have been taught that "phonics is bad," and who inflict upon parents a broadside of the above arguments. Reasons favoring phonics are:
a. The most basic reading reflex is to recover speech sounds from the printed symbols, thus recovering linguistic structures (syllables) which are crucial to meaning. Whole-word memorization obscures linguistic analogies such as good:goodness = bad:badness.
b. A phonics method fosters an analytical, problem-solving approach to new learning tasks; a word-memorization approach fosters guessing.
c. Whole-word memorization overloads the memory banks, and leaves one impotent in expanding one's horizons later in life. (I see older students and adults, with sight-word habits, who flounder in unfamiliar material.)
d. The alphabet is one of civilization's most powerful inventions. Sight-word methods ignore the alphabetic nature of English.
e. Research on learning shows that children do not initially learn whole concepts, but rather learn in segments in a "serial-apprehension" fashion. This argues that beginning with analysis of words by individual letters is more in keeping with children's actual learning modes.

Studies over the past 60 years show a preponderance of favor for initial phonic-emphasis methods. Jeanne Chall (Harvard Graduate School of Education, probably the foremost reading researcher extant), in her latest book, *Learning to Read: The Great Debate, Updated Edition,* comes down squarely in favor of initial structured phonics upon criteria of fluency, comprehension and speed. ". . . the research of the 1970s continues to support beginning programs that are code-oriented. . . . Indeed the research support seems even stronger than in 1967." She feels it ". . . disturbing to find reputable researchers . . . and teachers claim that direct phonics destroys reading for meaning when the research evidence indicates the opposite."

Much fanfare has been made about teaching comprehension ("reading for meaning"), but its handling makes it a red-herring issue. Not that comprehension isn't important, but the current practice of teaching myriad "comprehension skills" obscures the real problems: inadequate decoding skills and language and information deficits. More productive would be teaching children and getting them to think clearly.

An appropriate analogy is that of average adults trying to read a book on brain surgery. Although they may be able to read every word, they would comprehend little. But to help them comprehend, they would look not for a reading teacher but rather for someone who knows the subject, to teach the needed vocabulary and content.

Despite all the evidence, three out of four U.S. schools still use initial whole-word methods, and the "establishment" continues to blame failures on the student, his home environment, TV, etc. Senator Edward Zorinsky (D., Neb.) in introducing Senate Resolution S.J. 138 to examine teacher training, poses the question, "Why has remedial reading become institutionalized instead of training teachers to teach it right in the first place?"

Part of the reason is economic, in that certain publishers make handsome profits from the basal readers necessary for whole-word methods, and from the "special" materials used in the "remediation." (It costs little to equip a class for phonics: a $12 manual, paper, chalk and a teacher who knows what he or she is doing.)

There is much anecdotal evidence of publishers' wining and dining of textbook selection committees, particularly in states where state-wide uniformity is mandated, e.g., Texas. It is not uncommon for a publisher to run two separate versions of crucial texts (one just for Texas), or to tailor his national product toward the demands of Texas.

The waters are muddied still further by the fact that so many of the same anti-phonics educators who serve as professors in teacher-training institutions are also leaders in professional organizations (e.g., the International Reading Association) and are members of the editorial boards of the involved publishers.

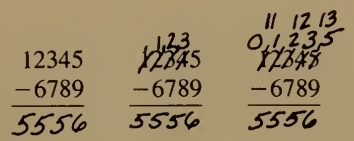
Mathematics and Science Education

Reading is the basic basic, providing the information-handling capacity needed for mathematics and science. I have been tutoring a high school senior in physics. She is a bright girl who is applying to (and will probably be accepted by) the Massachusetts Institute of Technology (MIT). She attends a decent private school, but has trouble reading some of the physics material, because she lacks phonic skills for attacking unfamiliar words. I see many like her.

Everyone knows that math is a hierar-

"You may think sounding out words is just common sense. But there are thousands of teachers who have been taught that 'phonics is bad.' "

chically structured subject: You learn addition before subtraction and multiplication before division, and so on. But the broader spectrum of the hierarchy is not understood or applied by many teachers and school systems. For example: Subtraction with "borrowing" or "regrouping" was taught to me in terms of strictly mental operations, i.e., I was not allowed to write any extra notations on the paper (I had to keep thinking). Contrast this with the various levels of auxiliary marks I have seen children using as part of their school-mandated processes:



Not only are the marked regroupings a non-thinking and time-consuming procedure, but can you imagine what it's like doing the long-division algorithm when every subtraction operation is like one of those at the right?! Also, some students are never taught short division, and every one-digit division is performed via the long division algorithm.

Fractions is another key level of hierarchy, with which my learning center spends more time than any other math item because it is so poorly taught. Common fractions form the basis for understanding of both decimal fractions and percentage. Algebra and trigonometry use the fraction to express intrinsic divisional relationships, a situation which becomes incomprehensible to students who flounder in fractions.

I have spoken with a number of math and science teachers whose chief gripe was pressure from the administration to pass deficient students just to get them out. Students perceive these situations, and use them in ways which deprive good teachers of the satisfaction of being able to do a good job. Improved management is needed to maintain the healthy academic rigor in which mathematics and science can flourish.

Remedies, Resources, and References

There are already many parents and parent groups who know that something is wrong, but who feel impotent against the stonewalling of the establishment. There are also insightful educators inside the system, who sometimes can do little reforming without suffering administrative reprisals.

The role I see for the industrial/technological community is that of infusing the "excellence" effort with professional expertise and leadership through critical advocacy of whatever curricula and methods can stand up to scientific examination for effectiveness. The intellectual clout of persons who are skilled in the management of resources, who can interpret statistics, recognize misuse or distortions of data, and advocate clearly for strategies with proveable pragmatics, is a necessary element of national efforts for enabling children not only to "learn to read," but also to "read to learn."

To provide some ammunition for parents and "trapped educators," consider the following recommendations:

1. Start a campaign to eliminate the general use of whole/sight-word teaching as an initial approach to reading. Legislation may become necessary.

2. Press local school administrators to justify their curriculum choices on scientific grounds. Reading Reform Foundation (RRF) can furnish information on phonic-based systems which have good track records, and evaluation guidelines and brief tests to see if your child is learning to read properly. Members of the Orton Dyslexia Society also have expertise.

3. Urge your school board to investigate (possibly emulate) examples of good educational management, such as the Network for Outcome-Based Schools. Consider also the "quality control" proposal formulated by the National Committee for Citizens in Education and described by Copperman in *The Literacy Hoax*, namely, an independent group to manage all testing in a school district, responsible solely to the Board of Education.

4. Get to know and support other organizations with expertise to offer: Feingold Association, Fortune Society, Council for Basic Education, National Committee for Citizens in Education.

5. Increase the use of nutrition management (instead of drugs) in treating hyperactive children and as an aid in optimizing student performance in general.

6. Consider support for Senate Resolution SJ 138 for a National Commission on Teacher Education, and other means of illuminating important problem areas.

7. Above all, open and maintain dialogue between the education professionals and the professional/scientific community. Form study/action coalitions that meet regularly. As a starting point, I can provide you a bibliography; it will lead your group(s) to more.

Be wary of "research" writings that fly in the face of reason and common sense. Get in to the nitty-gritties of curricula, learning processes and testing technologies. (A good statistician is necessary here.) There are good educators in the system who can help root out ineffective practices, and who will need more than just moral support in sensitive areas where the establishment defenses will be up to protect territorial sacred cows.

After 25 years in engineering, in 1970 Charles M. Richardson, P.E. '46 EE, opened a basic-skills learning franchise, Learning Foundations Tutoring Center, in Dix Hills, NY. He holds an M.S. in education from C.W. Post College, plus three New York State teaching certificates. In 1983 he returned to engineering in the radar transmitter section of Sperry Corporation while continuing to direct Learning Foundations. His address is 270 Deer Park Avenue, Dix Hills, NY 11746.

WPI CLASS NOTES

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1925

Reunion **May 30–June 2, 1985**

1930

Reunion **May 30–June 2, 1985**

The August issue of the *Harvard Business School Bulletin* ran an update on **Carl Backstrom**, which told of his alumni involvement at WPI, including his co-chairmanship of the 50th class reunion in 1980. "Am now working on letters to the class for our 55th in 1985," he says. He keeps busy with traveling and gardening.

Stanley Fillion writes, "We are pleased to be back in the East." The Fillions, who had lived in Illinois, now live in a hillside ranch house surrounded by trees, shrubs and flowering plants in Norwood, MA. Stan recently learned that an unbreakable railroad car centerplate (corset) that he designed during his last year of employment is still being manufactured by Dresser, keeping 125 men employed continuously.

George Fitt, who retired in 1972, formerly owned and operated apartment complexes in Fort Lauderdale and Delray Beach, FL. Earlier, he had been in the restaurant and hotel business as manager and owner. During his career, he was also an analytical chemist for Molybdenum Corp. of America in York, PA, and a chemist at Pacific Print Works, Lawrence, MA.

Carl Backstrom, Class Secretary

1933

Hugo "Duke" Borgatti, who lives in Dunedin, FL, is one of many who says he had a great time at our reunion, his first since our 5th. He's kept busy since his 1974 retirement from Uniroyal with volunteer work three days a week at a local hospital. He traveled some with his wife, Kay, until her death in 1981, and he continues to do so on his own.

Duke has found a unique way to see the Canadian Rockies, the Purcell Mountains in British Columbia. He took the Tauck Bugaboos tour in August and enjoyed several helicopter drops and pick-ups each day, as well as hikes on glaciers, mountain tops and alpine meadows with flowers in bloom. "Even saw a beautiful rainbow below us one morning." Duke visits **Art Glow** and **John Rigney** in Massachusetts nearly every year.

Ellis Brown writes that his retirement consists of enjoying the same "stuff" he's been doing for years, designing and building in the commercial and industrial area, but at a more leisurely and selective pace. He says that his operation is now reduced to a manageable one-man staff, "and surprisingly enough it puts some of the fun back into the construction business."

Barbara and **Al Brownlee** recently made a whirlwind tour through Italy, Switzerland and France, going from Rome to Paris in 10 days by train, by bus and on foot. After getting deep into art, religion and architecture, and into museums and cathedrals and basilicas, "it was a welcome relief on the last night in Paris to take in the exciting show at the famed Moulin Rouge."

Al Fuller and his wife, Jean, are spending a leisurely retirement in East Providence, RI, where he is still active in the Rotary Club and serves his church as a deacon. There are the usual visits with children and grandchildren, and special this year was the recognition he received for a half century of membership in the American Chemical Society, as well as recognition as a 50-year Mason. (Seems like you've been around a long time, Al!) He also continues his interest in genealogy and is treasurer of the Society of Mayflower Descendants in Rhode Island.

Art Glow retired at age 62 (way back in 1973!) after nearly thirty years at the East Pepperell plant of the Bemis Co., where he was supervisor of machine development, procurement and maintenance, as well as of building construction and maintenance. He and his wife, Margaret, traveled extensively, including a week high up in the Andes and another camping on the Amazon. In July of '81, she suddenly became ill when they were playing golf, and in November of that year she died. Art says that although he has the "normal amount of rattles, dents and loose bearings," he remains busy keeping house, cutting wood, playing golf, gardening and visiting and being visited by three married children and seven grandchildren.

Another '33 graduate who is enjoying his retirement, which is in its 12th year, is **Linval Harvey**, who spends his winters in Vero Beach, FL, and his summers in Swansea, MA. He is a sailor, and this season is the sixth one in which he and his wife will have traveled the Intercoastal Waterway between Massachusetts and Florida. More than one of your classmates surely envies you in this endeavor, Lin. It was good to hear from you.

Here's a man who refuses to give up the challenge of design and invention. It's **John Magee**, who was just issued his 15th patent. John's firm is the Elevator Research Co. in New York, and several of his patents have been safety oriented. Based on his own experience, he offers in his letter the following suggestions, "It strikes me that other 'antique' engineers might use their spare time to rethink safety implications in their areas of expertise."

Another classmate who says that our 50th was great and confesses it was the first one he'd attended since 1938 is **Dick Merrell**. Dick, who lives in Walnut Creek, CA, says he'll try to get to our 55th in '88. (Looks like we'd better start planning for a good crowd!) Dick writes: "I play golf once or twice a week. Score's not too good, but we have fun. The rest of my time is spent keeping our yard and garden in fair shape. Retirement is wonderful!"

Sumner "Sunny" Norton is keeping up with the times. He just bought an IBM PC Jr., after taking an introductory course in computers, which he says he found "interesting but difficult." Also, he's still working, finishing his 50th year with Potdevin Machine Co., covering six states as a sales agent! He evidently hasn't been listening to the rest of us (correction, *most* of us!) praising retirement.

Our class was represented at the dedication of a new materials processing lab in honor of **Arthur Smith** at the newly renovated Washburn Shops on Oct. 19. Art's wife and son, Ken, represented him, because he was unable to attend due to illness. We also had a chance to see the very spacious and useful classroom on the third floor, which was made possible by our 50th reunion gift to WPI.

Sumner Sweetser writes that retirement continues to be very pleasant, with perhaps the best feature being the freedom to set one's priorities. He splits his time between New Jersey and Massachusetts, with occasional visits to Florida and Louisiana. He tells of a whale watch out of Plymouth which proved exciting: A pair of the giant mammals "jumped almost clear out of the water, and spouted so close to the boat as to spray the passengers. They then stood on their heads as they dove so that their identifying markings on the underside of their huge tails could be seen clearly." He also notes that "whales have a very bad breath."

Jerry Vail, our eminent reunion master of ceremonies, claims he and Glad haven't done anything spectacular this past year, but that it's still been enjoyable. In September they visited their son, Dave, a professor of economics at Bowdoin in Brunswick, ME. Later, they celebrated their 45th wedding anniversary by spending four days in New York City, where they took in the opera at the Met, the new Seaport, the Metropolitan Museum of Art and the Broadway show, "My One and Only." They'll be staying in Florida, for three months starting in January. Their address is: 52 Woodland Drive, Apt. 201, Vero Beach, FL 32962. Tel. (305) 569-6646.

Attending the 55th class reunion of Worcester's South High were **Bob Ferguson** and **John Dwyer** of Worcester and **George Lyman** of Suffield, CT. If **Art Smith** had been well, he probably would have attended, too. Bob is president of the South High Class of 1929 and George is president of our Class of 1933.

Participation by the Class of '33 in the 10 a.m. (monthly) second-Thursday Tech Old-Timers meetings at WPI has been good. Among those attending have been **Ed Allen, Al Brownlee, Norm Clark, Ed Conway, Tom Decker, John Dwyer, Al Glenn, Ed Johnson, Art Klebart** and **George Lyman**.

Your secretary is enjoying the responses he is getting to the recent requests for news and views from our members. He will soon be contacting those we haven't heard from, since our objective is to get everyone into the act. Incidentally, he took **Sumner Sweetser's** advice and went whale watching in October on the *Dolphin* out of Provincetown. Just as Sumner described, it's fascinating!

Al Brownlee, Class Secretary

1935

Reunion **May 30–June 2, 1985**

1937

Allen Benjamin, who retired in 1980 as a professor in WPI's civil engineering department, had a show featuring his watercolors, "Travel Impressions," at Babson College in Wellesley, MA, from Oct. 18 to Nov. 12. He began painting only three years ago, taking classes at Arts/Wayland. Since 1982, he has produced more than 30 landscapes, Indian figures and portraits. Prior to his retirement, he had also served as a planning consultant with the Alliance for Progress for many years. In this capacity, he traveled extensively in Central America, recording his travel impressions in a photographic slide collection. These slides, along with New England photographs, provided the subject matter for most of the paintings in the Babson exhibit, his fifth exhibit since his first in the Wayland Public Library in 1983.

1939

Since his retirement from Norton in 1983, **Robert Bergstrom** has served as a part-time consultant for industrial distributors. He has an MBA from Harvard.

1940

Reunion **May 30–June 2, 1985**

Clark Goodchild continues with his volunteer computer work in the administrative office at Beverly (MA) Hospital. He also likes photography and amateur radio. He is a licensed operator, and his radio call letters are KA1ACM. A few years ago he had six antique cars, but now is down to one, a 1931 Model A Ford roadster. He enjoys repairing aluminum lawn chairs for friends. Instead of charging for the service, he asks the owners to donate to the Church in the Cove. At one time, he wrote a column for the *Beverly Times* called "Aviation News."

1942

Recently, **Paul Disario** was project director for the demolition of the old brick Stamford, CT,

Michael Carroll

Homecoming '84: *Four of WPI's greatest athletes and 1984 Hall of Fame inductees, before a record Homecoming crowd at Alumni Field.*

railroad station. This year, with the expenditure of $50 million of federal, state and city funds, a new aluminum, concrete and steel depot will be completed over the railroad's four tracks.

1945

Reunion May 30–June 2, 1985

Francis Johnson serves as chief engineer at Smith Valve Corp., Westboro, MA.

The Rev. **Edward Swanson** has been interim rector of St. Andrew's Church, Kansas City, MO, since May 1. He writes he expects to hold the post for one or two years.

1946

Gary Hovhanesian has retired after 38 years in GE Housewares, following the sale of that business. He says, "After making all the house repairs long overdue, I'll try to keep busy either teaching or consulting."

1947

Philip Scott writes that he is in his 28th year with Pratt and Whitney's Government Products Division near West Palm Beach, FL. He serves as a project engineer in the advanced engine design group, specializing in high technology exhaust nozzles for AF fighter aircraft engines. His earlier work was with the AF's airborne high-energy laser, NASA's Space Shuttle main engine, and the J-58 and F-100 jet engines. He says he and his wife, Betty, are looking forward to his retirement "quite soon."

1948

Frank Holby, manager of compensation for Ozalid Corp., of Binghamton, NY, was the author of "How to Avoid the Comparable Worth Trap," which appeared in the June issue of *Personnel Administrator.* He has an MBA from Columbia University.

A.S. Kelsey works for Grumman Aerospace Corp., Bethpage, NY.

Edwin Strain is retired from Dayton Power & Light in Ohio.

1950

Reunion May 30–June 2, 1985

John Cocker is a member of the technical staff with Bell Communications Research in Red Bank, NJ.

Raymond Costine continues as director of process engineering at Cryovac, Duncan, SC. He has been with the firm, a division of W.R. Grace & Co., for 25 years.

Andre Tasso has won the best paper in corporate and organizational management from the Foundation for Administrative Research, with the support of the Society for North American Corporate Planning. His paper, entitled "The Outrigger Principle: A 'New' Model for Dynamic Stability and Continuity in Management and Government," was presented at the Academy of Management's annual meeting in Boston in August.

1951

Alan Hansen works as a sales engineer at Medsker Electric in Farmington, MI.

Donald Lewis is general sales manager for Uniroyal Inc., Middlebury, CT.

Frank MacPherson was recently named head of the special business section of the Westfield (NJ) United Fund. Currently he serves as a member of the United Fund board of trustees. He also has been a member of the town council and president of the Y's Men's Club and the local Jaycees.

John Seguin, an account executive for Norton Co., Worcester, resides in Newport News, VA.

Donald White is a sales engineer for Norton Co. in Livonia, MI.

1953

Alfred Bafaro, owner of Four Oak Realty Trust and Albro Construction Co., Framingham, MA, has been building condominium complexes for nearly 18 years. His most recent endeavor is the construction of Bolton Oaks Condominium, a $24 million, 340-unit community in Clinton, MA.

Francis "Bud" Madigan, president of Worcester's F.W. Madigan Co. Inc., is president of

All in the Family

When Lincoln Thompson '21 (MS '23), trustee emeritus, and his wife, Anna, celebrated their 60th wedding anniversary last summer, three generations of Thompsons came together under one roof—*all* WPI graduates! Besides Lincoln, there were his son, Ronald, Sr. '52 and *his* son, Ronald, Jr. '83.

"It was like a family reunion and WPI mini-reunion rolled up in one," says Ronald, Sr., who hosted the anniversary party at his home in Madison, CT, Aug. 25.

Also on hand for the festivities, were Lincoln's cousin, Milton Ekberg '32 and his grandnephew, Roland Brooks '79 (MS '84). Other guests included Robert Chapman '21 and Harold Berg '20.

Lincoln Thompson, a pioneer in the sound recording industry, originally worked for the Victor Talking Machine Company, which became RCA. He was a founder of the Soundscriber Corp. in New Haven and later became president and CEO of Raymond Engineering in Middletown. He retired from Raymond in 1968, after leading the company for 15 years.

His son, Ronald, Sr., is the founder and president of TAT Engineering of North Branford. He designed, manufactured and is currently distributing a line of pumps for industrial purposes. Grandson Ronald works for the United Bank in Denver.

Milton Ekberg is president and treasurer of his own business, Abrasives and Tools Inc., West Springfield, MA. Roland Brooks is involved with computer graphics at Synermation Inc., Woburn, MA.

Harold Berg has retired as head of Stone and Berg, the family lumber business in Worcester, and Robert Chapman is retired as chairman of the board of R.E. Chapman Co., Oakdale, MA.

60th anniversary guests: Lincoln Thompson, r.f., Harold Berg, l.f.; standing l. to r., Ronald Thompson, Sr., Milton Ekberg, Ronald Thompson, Jr., and Roland Brooks.

the 15-member Worcester General Building Contractors Association. Also, he is active in the Associated General Contractors of Massachusetts and in its 10,000-member Associated General Contractors of America. An article spotlighting Madigan and his company appeared in the April issue of *Business Digest of Central Massachusetts*.

1954

Donald Ross has been promoted to president of MPB Corporation, Keene, NH. He is responsible for MPB's divisions, including Miniature Precision Bearings of Keene, Split Ballbearing and New Hampshire Industries of Lebanon, NH, Andrews Bearing Company, Spartanburg, SC, MPB Europa in the Netherlands, and an affiliate company, Pneumo Precision Inc., also of Keene. Prior to his promotion, he had held several divisional management posts. He has served as a director and president of the Lebanon Chamber of Commerce and as a director of the National Bank of Lebanon, United Way, Lebanon Industrial Development Association and the local Boy Scout council. Don is a former executive vice president of the WPI Alumni Association and a past chairman of Alumni Publications Committee; he now serves on the Association's Budget Audit Committee.

1955

Reunion May 30–June 2, 1985

Stanley Clevenger is president of Walston Woodcraft in Spofford, NH. He holds an MBA from Northeastern.

1956

Michael Gordon has been named senior director of product marketing at the Kearfott Division of the Singer Company. He is responsible for directing the division's domestic product-applications marketing functions and the field marketing departments.

John Nash holds the post of safety and environmental manager at Koppers Co. Inc., Cicero, IL.

Roy Stone is supervisor of software engineering at DEC, Merrimack, NH.

1957

John Braley holds the post of regional sales manager for Information Handling Services in Santa Ana, CA.

Daniel Fisher, Jr. of Chelmsford, MA, has been appointed manager of development engineering at BTU Engineering Corporation. The company produces manufacturing equipment, software and controls for the semiconductor, electronics packaging and specialty materials industries. Fisher has responsibility for BTU's product development in areas that include diffusion and furnace automation, gas system electronics and continuous process furnaces. Previously, he was an engineering manager at Design Technology Corporation, working on the automation of high-speed testing machines. Also, he was a project manager at Leesona Corp. and General Dynamics. He is a certified manufacturing engineer.

Donald Girard is employed at Raytheon Co., Bedford, MA.

Joseph Weber is assistant materials project engineer at Pratt & Whitney Aircraft, West Palm Beach, FL.

1959

Fred Blonder owns F&M Electronics/Radio Shack in Jay, ME.

George Fotiades is co-owner of the Webster House Restaurant in Worcester. The restaurant, which serves 800 to 1000 customers daily, is 2½ times larger than it was in 1978.

Winthrop Wassenar has been named a director of the Bank of New England-Berkshire County in Williamstown, MA. He is director of physical plant at Williams College. A registered professional engineer, he has done graduate work at MIT.

1960

Reunion May 30–June 2, 1985

Dr. **John Haavisto** is slated to be the guest speaker on March 14 at a meeting of the 1984-85 seminar series planned by the Boston chapter of the IEEE Quantum Electronics and Applications Society. Haavisto, a senior technical staff member of the Northrop Corporation, Norwood, MA, will discuss "Laser Gyros Using Integrated and Fiber Optics."

1961

Edmund Wozniak has been named vice president and general manager of the Sterling Die Operation of the Pratt & Whitney Machine Tool Division of Colt Industries Inc., Cleveland, OH. Since 1979, he has been manager of manufacturing services and materials at the P&W machine tool division plant in West Hartford, CT. He joined the machine tool division as a plant engineer in 1968 and subsequently served as supervisor of technical plans and services, manager of manufacturing systems and manager of planning and product development. He has an MBA from Babson College.

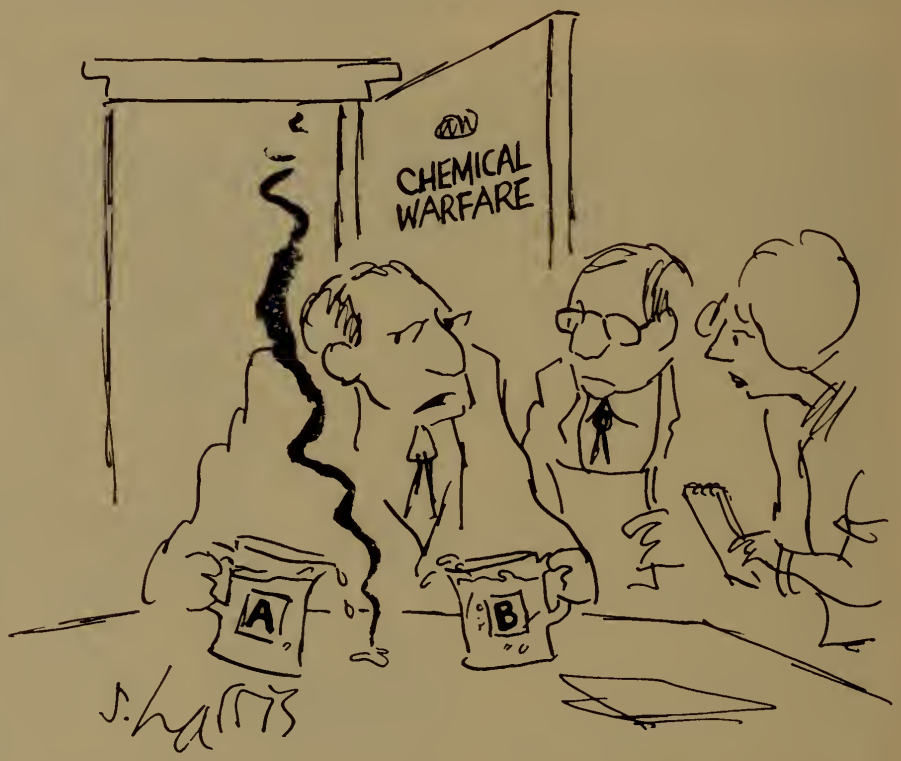
Rimas Zinas has been named technology program manager of control systems and energy at Bethlehem Steel Corporation.

1962

William Shepherd is now assistant vice president for information services at Citicorp, New York City.

1963

Dr. **Harry Hoyen** of Eastman Kodak Research Labs, delivered an invited paper at the East-West Symposium on the Fundamentals of Pho-



"The beauty of this system is that Substance 'A' is perfectly harmless, and Substance 'B' is perfectly harmless, and only if they mix together . . . oops. . . ."

tographic Imaging in Hawaii in November. The meeting was composed of about 100 scientists and engineers, most from Japan, China and the U.S. In November 1985, he will serve as general chairman of the Symposium on Imaging Science in Washington, DC. Four areas will be discussed: Graphic arts-prepress; education in imaging sciences; image analysis; and electronic imaging—analog to digital/digital to analog systems.

Dr. **Richard Iacobucci**, as director of the Nature Preserve Inc., a wildlife sanctuary in Pembroke, MA, has announced the expansion of the preserve's holdings to 70 acres, including 22 acres of undisturbed woodland. He says classmates living in the area are welcome to inquire about free membership for picnicking, camping or jogging on the extensive trails. Tel.: 617-826-8888.

Robert Jamaitis has been named vice president of operations at Norden Systems, Norwalk, CT. He will provide management direction over all Norwalk operations activities, including manufacturing, manufacturing-engineering, production programs and administration, production planning and control, materials, plant engineering and product assurance. Also, he will provide functional management direction for all operating units, including United Space Boosters Inc. and Chemical Systems.

Richard Marcy, Jr. is vice president of the First National Bank of Boston.

Steve Mozden is senior engineer for preliminary design at Hamilton Standard, Windsor Locks, CT. Last year, he received his MBA from Western New England College.

Arthur Pratt continues as principal engineer at Edwards & Kelcey in Livingston, NJ.

John Slovak is with The Water Factory in Costa Mesa, CA.

1965

Reunion **May 30–June 2, 1985**

Robert Cahill has been elected to the board of directors of the Manufacturers' Association of Delaware Valley in Pennsylvania.

Jim Fee is the founder of Data Innovations in Lowell, MA.

1966

MARRIED: Stephen Hebert and Carol Price on October 26, 1984, in West Boylston, MA. **Tom Benoit** was a member of the wedding party. Carol, WPI events coordinator, graduated from Becker Junior College and attended Worcester State College. Steve is director of development and alumni relations at WPI.

Brian Gallagher works as a sales engineer for GE in Charlottesville, VA.

1967

Charles Blanchard is environmental products manager at CPC Engineering Corp., Sturbridge, MA. One of the firm's products is the "Internalift," a machine that can lift large flows of water, other liquids and solid-liquid mixtures to heights of 40 feet or more. Internalift is used in the environmental and industrial waste removal fields.

Curtis Carlson was recently promoted to director of information systems research by RCA, where he has responsibilities in artificial intelligence, home computers and communications networks. Previously he was head of digital image processing and high-definition TV research and worked in physical optics at RCA Laboratories in Princeton, NJ. He has a PhD in geophysical fluid dynamics.

Dr. **Richard Gutkowski**, associate professor of civil engineering at Colorado State University, has been appointed chairman of the administrative committee on bridges of the American Society of Civil Engineers. The committee directs national efforts related to bridges by promoting better design and construction, encouraging needed research and effecting technology transfer pertinent to engineering and safety requirements. Gutkowski has done research on glued laminated timber bridges and recently led a national inspection team which examined experimental Forest Service timber bridges in seven states.

Paul Kennedy, general manager of Kennedy Die Castings, Worcester, has been elected second vice president of the Society of Die Casting Engineers (SDCE), a Chicago-area based professional group representing the industry inter-

Heikki Elo at work.

Fuel Pellets From Garbage—Wave of the Future?

Heikki Elo '50 CE, president of Lehigh Forming Co. of Easton, PA, has a really "neat" idea for disposal of solid wastes. Instead of using land-gobbling landfills, which have no payback, why not use a waste-to-fuel-to-energy system, which takes up less space and pays off in fuel?

His firm, Lehigh Forming Co., turns solid wastes into fuel pellets. "We offer a service that is a viable alternative to landfills," he says. The firm takes waste and mechanically separates materials. Then, the combustibles are extruded into pellets to be used as fuel in year-round steam-employing operations.

Although his company does not collect waste, it is under contract with its customers to deliver the fuel pellets, install the necessary boiler equipment and haul away the resulting ashes. It offers a much faster disposal time than conventional disposal methods.

"Only about 25 percent of the waste we process is returned to landfills," Elo says. "And that is material which cannot be made into pellets, or ashes resulting from pellet combustion." About 5 to 10 percent, he notes, are ferrous metals, which are recovered and sold back to scrap yards.

Elo, who has published many papers for the Governor's Council, the Pennsylvania Academy of Science, the ASCE and Lehigh University, is looking toward medium-sized communities as he plans for the expansion of Lehigh Forming. "There is already one operating plant in Easton," he says. "Two boilers have been installed there using fuel pellets to produce steam for a food-processing plant. And negotiations are under way with other steam users."

Response to the Lehigh Forming System has been overwhelming, according to Elo. "Garbage disposal is a worldwide problem," he says. "We've received inquiries from as far away as the U.S.S.R."

Michael Carroll

Homecoming '84: *Gerry Buzanoski '74 with sons Timothy and Todd, under the spell of magician Steve Dacri '74.*

nationally. Active with SDCE New England for 10 years in numerous positions, in 1978 he became a national director. He had served as chairman of the education committee and as a member of the publications and constitution/bylaws committees. In 1983, he was elected SDCE secretary.

Alan Larson serves as analyst of computer techniques for GE in Burlington, VT.

Jack Rahaim has been named corporate manager of personnel systems, administration and finance at Digital Equipment Corporation. A DEC employee since 1980, Jack was most recently corporate manager of personnel administration. Previously, he worked as a technical product manager and planner in the building controls industry. He has an MBA from the University of New Haven.

George Rand, Jr. is employed at Union Carbide in Long Beach, CA.

1968

Currently, **Donald Bergstrom** serves as project engineering manager for Cianbro Corp., Windsor Locks, CT, covering construction projects in Connecticut and Western Massachusetts.

Israel Mac holds the post of vice president of Mac Steel Co., Rutland, VT. He and Bette reside in Pittsford and have two children.

1969

Robert Magarian serves as plant manager at Lloyd Mfg. Co. in Warren, RI.

Ronald Roberts is engineering manager for AT&T Technologies Inc. in Newark, NJ.

Frederick Spreter holds the position of district manager for the Masoneilon Division in Houston.

1970

Reunion **September 28, 1985**

MARRIED: Alexander Murdoch and Claudia Zawilinski on September 8, 1984, in Gloversville, NY. Claudia, a graduate of Amsterdam High School, serves as a senior programmer at GE in Schenectady, where Murdoch is employed as an application engineer.

Joe Cascio works for Cadre Tech. Inc., Providence, RI.

Roger Etherington is now senior technical service representative for Vulcan Chemicals in Birmingham, AL.

Domenic Forcella has resigned as executive director of the Connecticut Council on Environmental Quality. While with the council, "Dom" was concerned with a number of issues, including hazardous waste, drinking water contamination and solid waste. Currently, he is studying for a PhD in environmental design and planning at Virginia Polytechnic Institute, where he is doing research on the public's perceptions of hazardous waste facilities.

John Garrity was recently named manager of the Maine Yankee nuclear power plant in Wiscasset. With the Central Maine Power Co. since 1970, he began his career with Maine Yankee two years prior to the plant's completion. He served as an assistant engineer in the reactor and computer engineering department and worked on-site through the plant's construction and start-up. In 1981, he was named senior director of nuclear engineering licensing at Maine Yankee's Augusta headquarters.

Chip Hassett has joined Environmental Resources Management Inc., Washington, DC, as manager of engineering design. His specialties are engineering design of wastewater treatment facilities, wastewater collection and transmission systems, industrial waste treatment facilities and water management systems.

Bradford Myrick is a senior engineer at Northern Research & Engineering Corp., Woburn, MA.

Kenneth Oberg is a senior management analyst for Florida Power & Light in Miami.

Roger Wilson wrote "Study for Decommissioning Coal-fired Power Plants," which appeared in the August issue of *Power Engineering*.

1971

MARRIED: John Oscarson and Martha Parry on September 15, 1984, in Mystic, CT. She received her bachelor's degree from the University of Pennsylvania School of Occupational Therapy and her master's from UConn. She is an environmental designer in North Kingston for the state of Rhode Island. He is a research engineer at Pfizer Inc., Groton, CT.

Michael Kajen has joined the Bloomsburg (PA) University faculty as assistant professor of computer and information science. Previously, he was a database analyst at the University of Massachusetts. He holds an MS in computer and information science from UMass.

Paul Pakus serves as branch supervisor at the Naval Ocean Systems Center in San Diego, CA.

Michael Santora, previously a consulting engineer with Shoenfield Associates Inc. of Boston, has been appointed town engineer in Milford, MA. A registered engineer, he was formerly assistant to the Holden town engineer.

Fred Szufnarowski was recently promoted to senior engineer in the generation engineering department at Northeast Utilities. He holds degrees from WPI and UMass, Amherst.

1972

Michael Rapport is an assistant actuary at Penn Mutual Life Insurance Co., Philadelphia.

The Fiberoptic Division of Augat Inc., Attleboro, MA, has announced the appointment of **Robert Roland** as interconnection development engineer. Formerly, he was senior project engineer at Brewer Engineering Laboratories, a unit of Teledyne Engineering Services.

1973

MARRIED: Garry Boynton to Debra Arberdale in Housatonic, MA, on August 11, 1984. Debra has a bachelor's degree in nursing from Russell Sage College, Troy, NY. Garry is an environmental chemist for the state of New York.

William Ault holds the post of supervisor of product engineering at Norton Co., Worcester.

Dave Cirka writes that he has "made it to the top." On June 18, he and 11 companions reached the 20,320-ft. summit of Alaska's Mt. McKinley, the highest peak on the continent. The ascent took 13 days, the descent 2 days. He says that in his dreams, the climb began 12 years ago when he joined the WPI Outing Club, where his "appetite was whetted for the vertical parts of the world."

Ronald Lak is a facility engineer at Uniroyal Chemical in Gastonia, NC.

William Mawdsley was recently elected second vice president and actuary at State Mutual in Worcester. He joined State Mutual in 1973, was named associate actuary in 1978 and assistant vice president in 1981. He is a fellow of the Society of Actuaries, a chartered life underwriter and a chartered financial consultant.

Robert Nacheman has been named an associate of the affiliated organizations of Lev Zetlin Associates Inc. and Thornton-Tomasetti, Engineers and Designers, in New York. He has been involved in the design and administration of several projects, including the $85 million, 40-story Continental Center in New York City.

Edward Peczynski has been promoted to manager of process computer engineering at Northeast Utilities' general offices in Berlin, CT. He joined the firm in 1973 as an assistant engineer in the System Planning Department. Prior to his promotion, he was manager of information resources planning and controls. Earlier he had been supervisor of engineering computer services and senior engineer in engineering software and development. A registered professional engineer, he has an MS from RPI.

1974

MARRIED: Michael Graham and Theresa Ritter in Quechee, VT, on August 18, 1984. She graduated from Regis College in Denver, CO, with a degree in psychology and from Albany (NY) Medical Center as a physician's

assistant. He is an associate consultant with the Wyatt Company, actuaries and consultants, in Wellesley Hills, MA. . . . **John Mathews** and Barbara Allen of Enfield, CT, on October 13, 1984. Barbara graduated from Wesleyan University. John, who is a senior engineer at Northeast Utilities, recently passed his professional engineer licensing exam in Connecticut. . . . **Steven Quist** to Wanda Burton in West Boylston, MA, on July 7, 1984. Wanda attended Evangel College and graduated from Atlantic Union College, Lancaster, MA. She is an RN at St. Vincent Hospital, Worcester. Steve graduated from Wentworth Institute and Fitchburg State College. He is employed by C.R. Quist, Contractor.

In April, *Boston Magazine* quoted **Garry Balboni**, project manager for the Perini Corporation, concerning the transformation of Harvard Square, Cambridge, during the Red Line construction project.

Stephen Rubin is president of Intellution Inc., which he founded in Westwood, MA, in 1980. The company's expertise ranges from system design and integration of small real-time systems to custom software packages for a wide variety of applications. Typical of the products offered by Intellution is its fully integrated control systems software called "The Fix." It provides big-system process control and monitoring capability with a personal computer-sized system. Rubin has lectured on industrial control using microcomputers and contributed to *The Layman's Dictionary of Computer Science*.

Ron Sarver continues as president of New England Party Supply Inc., Randolph, MA.

1975

Reunion **September 28, 1985**

MARRIED: John Bunzick and Carol Parker in Belmont, MA, on April 21, 1984. Carol graduated from Oberlin College and is employed by Survey Tabulation Services of Cambridge, MA. John, assistant engineering manager for Wonder Market Companies of Worcester, is also studying organizational psychology at Lesley College. . . . Dr. **Francis Kiernan** to Carol Ann Montanye in West Hartford, CT, on July 21, 1984. She graduated from Hartford Hospital School of Nursing and is an RN with the Visiting Nurses of Hartford. He received his MD from the University of Connecticut School of Medicine and served his internship at the Hartford Hospital, where he was a fellow in cardiology.

Raymond Acciardi was recently appointed senior quality assurance engineer by Construction Materials Consultants Inc., Colorado Springs, CO. He will supervise field and laboratory operations and coordinate operations with Lincoln-DeVore, CMC's sister firm. Previously, he was with the Bureau of Reclamation, where he was responsible for soil testing section research programs and the development of state-of-the- art geotechnical testing equipment designs. A registered professional engineer, he has an MBA from New Hampshire College in Manchester, NH.

Michael Ball, supervisor of maintenance of buildings and grounds for the Rutland (MA) School Department, also makes handmade wooden rocking horses and other play equipment for children at his company, Wood Products, in Holden. Besides the rocking horses, he makes rocking seaplanes and roadsters and a limited line of children's furniture, including toy chests and toolboxes. Currently, he sells his wood crafts wholesale to retailers in all six New England States, as well as to several stores in the Worcester area.

Mark Drown works for McIntire Co., Thomaston, CT.

Ed Griffin has been named international applications engineer for Megatek Corporation, San Diego, CA. He is responsible for Far East sales and supports the international sales office in Lausanne, Switzerland. In September, Ed, his wife, Alice, and their daughter, Sheena, went to Lausanne for two months, where he supported European computer graphics trade shows, including shows in Copenhagen and Berlin. In August, he completed his MBA degree in marketing at National University in San Diego.

Frank Moitoza is program manager at Naval Sea Systems Command, Washington, DC. Last May, he received his MS in systems management from the University of Southern California. The Moitozas and their two children reside in Springfield, VA.

Vance Rowe was recently promoted to production manager of the precipitated calcium

Michael Shanley

Now You See Him—

Steve Dacri '74, the actor-magician known professionally as the "Fastest Hands in the World," concluded his entertainment at his tenth class reunion by proving in spectacular style that he may well be the fastest escape artist as well.

After tying up his escape-artist wife, Marlene, and locking her in a trunk on stage at Alden Memorial Auditorium, Steve leaped onto the trunk, and hid behind a cloth. When the cloth dropped a split second later, Marlene was on top of the trunk with Steve locked and tied inside!

Another crowd pleaser was the disappearing $50 bill trick. After "borrowing" the bill from reunion chairman Garry Balboni, Steve "accidentally" burned it to a crisp with a cigarette lighter. Later, the bill, which had been signed by Balboni, was discovered rolled up inside a classmate's cigarette!

During Steve's performance, in which the phrase "sleight-of-hand" took on a whole new meaning, streams of colored handkerchiefs and decks of cards seemed to take on lives of their own—something of which the Las Vegas dealers had best be wary when Steve is in town. Steve often performs at clubs in Las Vegas and Atlantic City, as well as the world-famous Magic Castle in Hollywood.

"I've appeared with Bob Hope, Charo, Rodney Dangerfield, Phyllis Diller and Tony Orlando," Steve says. His TV credits include "Merv Griffin," "Candid Camera," and "That's Incredible!"

Recently, he completed his first book for the general public, *Fooling People: Magic Secrets for Everyone*, which will be published soon. "Early in the year, I'll be in video stores with my new home video instructional series. 'Magic Secrets'," he reports. "My home video series is the first that reveals and teaches 'miracles' which are easy to do."

A Worcester native, Steve had not appeared in his hometown for four years prior to his September reunion performance. Hearing his classmates' applause and receiving the keys to the City of Worcester made it a happy homecoming.

Michael Carroll

Homecoming '84: *Gerald Masi, David Scott, Class of '74 members, and Dave Taracani.*

carbonate department at Pfizer Inc., Adams, MA. He joined the firm in 1976 as a process engineer, became a project engineer in 1977 and was promoted to production supervisor in 1978.

Capt. **Douglas Sargent**, USAF, has been chosen as base company grade officer of the quarter at Thule Air Base in Greenland. The chief of programs and engineering with the 1012th Air Base Group, he was selected in competition among contemporaries for professional skill, duty performance and exemplary conduct.

Frank Vanzler now holds the post of project superintendent for Turner Construction Co., Boston. He was recently transferred from Turner's Cleveland operation.

1976

MARRIED: Kenneth Korcz to Patricia Shane in Syracuse, NY. Patricia holds an associate's degree from Onondaga Community College, a bachelor's from Syracuse University and a master's of divinity from Trinity Episcopal School of Ministry. She is employed by R.E. Dietz. Kenneth, who has a master's from Virginia Polytechnic Institute, works for Niagara Mohawk.

Robert Milk is a senior bank systems officer at Bank of Virginia in Richmond.

David Reid works for Arrington-Hobbs & Assoc. in Kissimmee, FL.

For the third time, **Steve Silva** has been selected as the Masters Award recipient by Tektronix Inc. The annual international award recognizes the company's top managers and salesmen. A Caribbean cruise is included as part of the recognition. Currently, Steve is the Northeast regional manager of the Tektronix Design Automation Group. He joined the firm, a manufacturer of electronic test equipment, in 1976. He has an MBA from Syracuse University.

David Vogt is an actuarial for American Universal, Providence, RI.

Paul Wheeler works as a project engineer at Perini Corp., Washington, DC.

Jeffrey Wilcox serves as administrative and controls manager for Mobil Oil Corp., Atlanta, GA.

1977

MARRIED: Norman Marshall and Wendy Walsh in Etna, NH, on June 23, 1984. Wendy graduated from Middlebury College and has a master's degree from Dartmouth College. Norman, a research associate for the New Alchemy Institute in Falmouth, MA, also holds a master's degree from Dartmouth.

Enrico Betti, who has an MSCE from Carnegie-Mellon University, is with Stone & Webster in Boston.

Douglas Elliot works as general foreman at General Dynamics, Groton, CT.

Thomas Kintz, who has an MBA from RPI, has been promoted to engineer at the Northeast Utilities Montville Station in Connecticut. He started as associate engineer at Montville in 1979.

Elizabeth Ernst-Mullin is employed as a

Michael Carroll

process development engineer at Norplex in La Crosse, WI.

Albert Riggieri has been elected associate actuary of the Paul Revere Companies. Most recently, he served as assistant actuary in the product actuarial area. He is a fellow in the Society of Actuaries.

Edward Smith is a project engineer at Marion Laboratories in Kansas City, MO.

Kurt Sonstroem works for Burton & VanHouten Engineering Inc., West Hartford, CT.

John Swalec, Jr. works as a research engineer for Union Oil Co. in Brea, CA. He has an MS in chemical engineering from the University of Washington.

1978

MARRIED: Bruce Bertrand to Joan Metivier in Worcester on June 24, 1984. Joan, personnel and operations manager at Horne's department store in Pittsburgh, PA, received a master's in business degree from Anna Maria College. Bruce is attending the University of Pittsburgh School of Medicine. . . . **Albert Schutz** and Joan Kasputis in Shrewsbury, MA, on June 17, 1984. Joan graduated from Millbury Memorial High School and is employed by New England Power Service Co., Westboro. Schutz works for Du Pont's N.E.N. Products Division, Billerica. . . . **Robert Zawistowski** to Diane Wight at Old Sturbridge Village, MA, on May 11, 1984. She attended Worcester State College and plans to enter the University of Southern Maine in Portland. He is a utilities technical and training director at S.D. Warren Co., Westbook, ME.

Thomas Edwards holds the post of technical director at PAR Technology Corp., Huber Heights, OH.

Michael Gantick now holds the post of director of public works and town engineer in Monroe, CT.

Keith Laird serves as a project engineer at Johnson Controls Inc., North Perry, OH.

Marc McCalmont serves as technical coordinator at Technical Communications Corp., Concord, MA.

Paul Peterson is now assistant to the plant manager at the American Hoechst Corporation's high-density polyethylene plant in Bayport, TX. Previously, he was in the company's sales and marketing office in Leominster, MA, where he conducted market research surveys.

John Wallace, a member of the technical staff at AT&T Bell Labs in Naperville, IL, was the co-author of "Designing for Ultrahigh Availability: The Unix RTR Operating System," which appeared in the August issue of *Computer*. He has worked in the Operating Systems Laboratory on the Unix RTR kernel since 1980 and is currently designing the kernel for a distributed multiprocessor system.

1979

MARRIED: John Arnold and Gail Wojnar in Westboro, MA, on June 23, 1984. A graduate of Holyoke Community College and Westfield State College, Gail is a systems consultant with Digital Equipment Corporation in Stow, MA. John serves as a software engineer with DEC in Hudson. . . . **Louis Feula, Jr.** and Georgia Panteleakis on August 26, 1984, in Cranston, RI. An assistant manager at Florsheim Thayer McNeil, Warwick Mall, Georgia graduated from Community College of Rhode Island. Louis works for Monsanto Co., Everett, MA, and is also enrolled in the MBA program at the University of Hartford. . . . **Seth Martin** and Deborah Slowe on September 29, 1984, in Harwich, MA. Deborah graduated from Southeastern Massachusetts University and works at The Gap. Seth is with Jim Dooley Realty, South Yarmouth, MA. . . . **Fred Siino** and Barbara Goody in July. Barbara is a graduate of Becker Junior College. Fred received his MSCE from Northeastern last fall.

BORN: to Debra and **Jeffrey Bouyea** a son, Jeffrey Michael, on December 1, 1983. Jeff is controller at P. Francini & Co., Derby, CT. Last year, he received his MBA from the University of Houston. . . . to Anna Jean and **Kenneth Oriole** a daughter, Jessica Anne, on August 8, 1984.

Joanne Beckett, who is currently a research

Vice President Judy Nitsch

Judy Nitsch Takes Top-Notch ASCE Young Engineer Award

Judy Nitsch '75, vice president and chief civil engineer with Allen & Demurjian Inc., Boston, was awarded the Edmund Friedman Young Engineer Award for Professional Achievement by the American Society of Civil Engineers at ASCE's annual convention in San Francisco in October.

The award is given annually to ASCE members who are 32 years of age or less, who are judged to have shown service to the advancement of the profession, who have demonstrated technical competence, character, integrity and leadership, and who have contributed to public service. This year two members received the award.

In 1982, Judy was honored by the Boston Section of the Society of Women Engineers (SWE) as the recipient of the National Distinguished New Engineer Award. She is president of the SWE Boston Section and vice president of the Boston Section of ASCE. A director of the Charles River Watershed Association, she also belongs to the National Society of Professional Engineers and to the Massachusetts Association of Land Surveyors and Civil Engineers.

At Allen & Demurjian, a consulting civil and structural engineering, architectural and surveying firm, Judy specializes in site planning and development. She has had assignments throughout the U.S. for companies like Showcase Cinema, McDonald's Corporation and General Cinema Corp. A registered professional engineer in twelve states, she was recently offered a partnership in Allen & Demurjian.

In 1980, Judy was featured on the "New England Today" TV program and on NBC radio's "The Woman's Program." A coauthor of *Terry's Trip*, a coloring book introducing engineering careers to grade-school girls, Judy is also vice chairman of the WPI Alumni Publications Advisory Committee.

Michael Carroll

Homecoming '84: *Susan and Tom Rockwood '79 at the Alumni Fund celebration.*

engineer for Union Carbide, holds two degrees from WPI.

Chris Corpuz is a consultant for Deloitte Haskins & Sells in Costa Mesa, CA. He holds a master's degree from Harvard.

Since 1982, **John Gordeuk** has been a systems engineer for the Space Shuttle mission simulator at Singer Co./Link Division. He studied for his master's degree at Rice University in the space physics and astronomy department.

Peter Gould works for Raytheon in Sudbury, MA.

Robert Hart serves as Southern California regional sales representative for Artel Communications Corporation.

Currently, **Bruce Jenket** is a quality assurance engineer at Varian Assoc., Palo Alto, Ca.

Paul Keary recently received his MSME from Oregon State University in Corvallis. He is a composite structural engineer at Boeing Aircraft, Seattle, WA.

Norman Lacourse has been promoted to project supervisor of natural polymer research at National Starch and Chemical Corporation, Bridgewater, NJ. In 1979, he joined the firm as a chemist.

Henry Lapa is with the U.S. Navy Patrol Squadron Sixteen in Jacksonville, FL.

Stephen Lesniewski writes that he has a year of veterinary studies remaining with the veterinary faculty of Warsaw (Poland) Agricultural University.

Sheng-Lung Lien is now a technical programmer/analyst at Nalco Chemical Co., Naperville, IL.

Christopher Mather has been promoted to district manager of instrumentation at Hewlett-Packard in Syracuse, NY. He is responsible for the management of sales in the Syracuse-Albany area. In 1979, he joined the firm as a field engineer. In 1983, he received the Upstate District Award and the Region Manager's Award for outstanding performance in sales.

Gary Pearson holds the post of Eastern regional distribution manager for Priam Corp., Needham, MA.

William Razeto works as a stress engineer at Boeing Aircraft in Seattle, WA.

Jim Rudolph is with High Voltage Engineering, Burlington, MA.

Robert Schifiliti of Westfield, MA, a fire protection engineer and systems consultant with Mass. Fire Alarms Co., has been chosen an Outstanding Young Man of America. He manages sales and engineering for the Lowell firm in western Massachusetts and Vermont. Currently, he is studying for his master's in fire protection engineering at WPI. He belongs to the Society of Fire Protection Engineers and is chairman of a task force trying to establish a nationwide computer system for rapid transfer of fire protection information.

Felix Vargas is a design engineer for Prime Computer in Framingham, MA.

1980

Reunion **September 28, 1985**

MARRIED: Mihran Aroian and Karen Frankian in Worcester on May 6, 1984. She attended Ripon and York St. John College, York, England and graduated from Connecticut College, New London. She is a copywriter for William Newhouse Advertising Agency, Houston, TX. He is a technical sales representative for Bethesda Research Laboratories. . . . **Michael Coomey** and Susan Higgins in Worcester on June 9, 1984. Susan, a sales promotion specialist at Data General, Westboro, graduated from Clark and is a graduate student at Anna Maria College, Paxton. Michael is a senior test engineer at DEC, Shrewsbury, and a graduate student at WPI. . . . **Thomas Egan** and Mary Krull in Marblehead, MA. Mary graduated from MIT and is working on a master's in material science at Stanford. Tom is a controls engineer at Axel Johnson Engineering Corp. in San Francisco. . . . **Wayne Isaac** and Nancy Catsam in Holliston, MA, on July 22, 1984. Nancy, a technical editor for Wang Laboratories of Lowell, graduated from Lake Erie College, Painesville, OH. Wayne works for the Mitre Corporation, Bedford.

MARRIED: Kevin Kelley and Cheryl Ann Campbell in Altomonte Springs, FL. Employed as a paralegal in Dallas, TX, she received her BA from the University of Central Florida. He is with InteCom Inc. of Dallas. . . . **Angelo Scangas** and Stephanie Poulopoulos recently in Lynn, MA. Stephanie graduated from Boston College and works for Jenis Insurance Agency in Lynn. Scangas is with Emhart Corporation of Middleton. . . . **James Torrey, Jr.** to Leslie Melkonian on September 15, 1984, in New Britain, CT. Leslie graduated from Boston College. . . . **David Weiss** to Rhonda Friedman in Providence, RI, on August 12, 1984. Rhonda graduated from URI and has a master's degree in social work from Adelphi University. She is employed by the New Bedford Area Center for Human Services. David holds a master's degree from Carnegie-Mellon and is with Teradyne in Boston.

Herb Dunnington holds the post of electronic engineer at Norton/Christensen in Salt Lake City, UT.

John Gusha, DMD, who graduated from Boston University Dental School last year, has opened a dental office in the Medical Arts Building in Holden, MA.

Capt. **Stephen Lawry**, USAF, is assistant professor of aerospace studies at St. Joseph's University, Philadelphia.

William Mangano, Jr. has been promoted to senior systems analyst within the systems organization at State Mutual in Worcester. He started with the company in 1982 as a programmer analyst and was promoted to systems analyst the following year.

Joseph Mayall serves as resident engineer at Babcock & Wilcox, Boston, MA.

John Pardo works for Kodak in Rochester, NY. In December, he received his MS from Penn State University.

Doreen Sa Vieira, an applications engineer in the microlithography division at Perkin Elmer, Wilton, CT, has been doing a lot of business traveling to the West Coast, the Southwest and Switzerland.

Gary Sawicki is a manufacturing project engineer at Medi-Tech in Watertown, MA.

Scott Sawicki serves as a senior test engineer at National Semiconductor, Santa Clara, CA.

Peter Sherer is a machine design engineer at Kodak, Rochester, NY.

David Wilson is a software engineer for Terak Corporation in Scottsdale, AZ.

1981

MARRIED: James Blickle and Diane Mowe in Hanover, NH, on September 8, 1984. Diane graduated from Becker and is employed by Allan Hirsch, DMD. Jim is attending Amos Tuck Business School at Dartmouth. . . . **Stephen Leslie** and **Mary Jane Montville, '83**, on June 3, 1984, in Worcester, MA. She is a process engineer at National Semiconductor, Danbury, CT, and he serves as a senior computer analyst at Travelers Insurance Co., Hartford. . . . **Scott Nisula** and Debra Grant in Sharon, MA. Debra has a BS degree in human services from Fitchburg State College and is a child counsellor in San Leandro, CA. Scott is a chemical engineer with Chevron Oil Company of Richmond, CA. . . . **Marylou Place** and John Domino on August 31, 1984, in New Bedford, MA. Marylou is administrative assis-

Joanne Beckett and Jack Tracy in Nepal.

Journey to the Ends Of the Earth

As children, many of us dreamed of taking wondrous journeys to faraway kingdoms nestled in storied mountain ranges. Recently, Jack Tracy '79 CE and his wife, Joanne Beckett '79 CH, made their childhood dreams come true. For two months, they trekked in the mountainous Asian kingdom of Nepal.

"Nepal, home to Mt. Everest, is the last frontier," Jack says. "On our trip there, we were accompanied by our friends Joe Gill and Jon Martinson of the Appalachian Mountain Club. We had perfect, post-monsoon, fair weather!"

Nepal is wrapped along the tectonic spine of the Himalayas, between India and Tibet. The capital, Kathamandu, is a symbol of the East with its busy open-air markets and Buddhist and Hindu temples. Nepal is a small kingdom, measuring roughly 500 by 150 miles. "However," says Joanne, "that description loses significance while negotiating its massive maze of ridges and 18,000-ft. passes."

The adventurers found a rugged landscape and a people whose smiles brushed aside the Third World realities of poverty. According to Jack, the Nepalis and transplanted Tibetans welcome strangers with the traditional, melodic "Namaste!"

Even by Nepali standards, the hikers were traveling in a remote region, amid the snow-capped Dhaulagiri and Annapurna Range, often called by veterans the greatest trekking area in the world. The group traveled more than 300 miles through mountainous Buddhist settlements, sharing homes and meals with the villagers. Meals consisted of rice, lentils and tea cooked in typical, one-room shelters.

"Life revolved around a central, primitive, smoky, clay stove," Joanne reports. "Conversations were clumsy streams of broken English and Nepali accompanied by mutual laughter as the Nepalis observed our strange Western manner and clothes."

Jack and Joanne found Nepal to be an amazing adventure. "The memory of the friendly faces of the Nepalis and the mountain peaks shrouded in alpenglow," Jack says, "will stay with us always."

tant to the vice president of engineering at ADE Corp., Newton. John, who holds a BS and an MSCE from RPI, is currently a student at Harvard Graduate School of Business Administration.

Richard Buckley is with Harris Co./RF Communications Div., Rochester, NY.

Jim Eilenberger continues as a project engineer at United Illuminating in New Haven, CT. Last summer, he played goalie on Willy J's soccer team out of Old Saybrook, CT. After the team won the state championship, it made a ten-day soccer tour of Ireland.

Mary-Jane Hall, a registered professional civil engineer in the state of California, is now a senior design engineer at Nasland Engineering in San Diego.

Maureen Higgins is currently a finance major and an MBA student at New York University Graduate School of Business Administration.

Mark Malenbaum is a space center planning engineer for the USAF in El Segundo, CA.

Lt. **Michael McDermott** is stationed at Minot AFB, ND.

Brian Minns, who works for 3C Electric, a testing and consulting firm in Ashland, MA, has been named as town underground foreman by the Electric Division, Wellesley, MA.

Tom Palmer serves as a senior manufacturing engineer for Harvey Hubbell Inc., Bridgeport, CT.

Ruth Adams-Teixeira is with the Massachusetts Department of Public Works.

Thomas Warnick works as a manufacturing engineer at Honeywell in Lexington, MA.

Dennis Wysocki is a supervisor for Clairol in Stamford, CT.

1982

MARRIED: Stephen Balcewicz and Donna Bourn on June 10, 1984, in Worcester. Donna, a graduate of Quinsigamond Community College, is a computer operator at Worcester Memorial Hospital. Stephen is with Guerriere & Halnon Inc., Franklin, MA. . . . **Paul Doe** to Susan Moll on June 23, 1984, in Bedford, MA. Susan, a clinical dietitian at the Catholic Medical Center, Manchester, NH, graduated from Framingham State College. Paul is assistant plant manager at Gemini Valve Co., Raymond, NH. . . . **John Erb** and **Lynn Beauregard** on July 28, 1984, in Gardner, MA. Lynn is with Western Electric in Burlington and John with GE in Lynn. . . . **Stephen Kaneb** to **Andrea Fielding, '84**, in Taunton, MA, on June 2, 1984. Andrea works for Hughes Aircraft, Fullerton, CA. Stephen is with Pacific Lighting Energy Systems in Commerce, CA. . . . **George Oliver** and **Karen Zalewski** on May 5, 1984, in Webster, MA. Karen is a software engineer for DEC and attends Northeastern University. George, a mechanical engineer for GE, is also attending Northeastern.

MARRIED: Barry Paquin to Deborah DuVerger in North Grafton, MA, on July 7, 1984. She graduated from Anna Maria College and is a laboratory technician at the Fallon Clinic. He is an electronics technician at DEC in Marlboro. . . . **Timothy Smith** and Ellen McPherson in Beverly, MA. Ellen graduated from Becker and from Centenary College in New Jersey. She is employed by Lee Jay Bed and Bath in Salem. Tim works for Varian Associates in Beverly, MA. . . . **Terry Soule** and William Witowsky on September 29, 1984, in Middletown, MD. William graduated from Stevens Institute of Technology, Hoboken, NJ. Both are employed by M/A-Com DCC Inc., Germantown, MD.

MARRIED: Philip Viall and Claudette-Anne Roy Morrissey on September 14, 1984, in East Freetown, MA. An RN with the Society for Human Advancement Through Rehabilitation Engineering Foundation Inc. (SHARE), she works with vocally impaired individuals. She holds degrees from Bristol Community College, the New England Institute of Applied Arts and Sciences and Southeastern Massachusetts University (SMU). He graduated from SMU with his BSEE and MSEE and serves as vice president and treasurer of SHARE, North Dartmouth, MA, which he helped found. . . . **Joseph Vignaly, Jr.** and **Katherine Kruczek, '84,** in West Springfield, MA, on September 8, 1984. Kathy is employed in management at New England Telephone & Telegraph, Framingham, and Joe, who is attending the master's program at Babson, works for GTE Systems Corp., Westboro, MA. . . . **Dana Whitney** and Lisa Miller on August 11, 1984.

in Cotuit, MA. She graduated from Worcester State College-University of Massachusetts Medical Center and is a nuclear medicine technologist at Cardinal Cushing Hospital, Brockton, MA. Dana holds the post of construction project manager for W-W Construction, Hopkinton.

Thomas Barrett serves as a process analyst at Pratt & Whitney Aircraft, East Hartford, CT.

John Bellantoni, who has been a design engineer for Alpha Industries, Lawrence, MA, is now working for his master's degree at Cornell.

Michael Bickford is a system sales engineer at Westinghouse, I/C Projects Division, Pittsburgh.

Mark Brown works for Westinghouse Electric Corp., Baltimore, MD.

James Diemer serves as analyst for Science Applications Inc., Falls Church, VA.

Cindy Gagnon finished first in the women's division of the Monmouth County Parks Sprint Triathlon (440-yd. ocean swim, 14-mile bike ride, four-mile run) in Long Branch, NJ. Until a year ago, she had never run, swum or bicycled seriously. Currently a member of Technical Staff Digital Support Systems at Bell Communications Research, Freehold, NJ, Cindy has an MS in computer engineering from the University of Southern California.

Stephen Hennigar holds the post of assistant superintendent at Turner Construction Co., Boston.

Steven McNary is about 85 percent of the way through the renovation of his 1926 Chevrolet Superior Model V grocery delivery wagon, a dream he's had since he was 16. The truck has all of its original gauges, but he had to build the wooden body. Since starting the renovation eight years ago, he's learned woodworking, engine rebuilding and welding. "I learned as I did it. It was great," he says. Steve works for GTE in Needham, MA.

John Nixon is a design engineer at General Dynamics-Electric Boat, Groton, CT.

David Rielly serves as an automation systems specialist with MCC Powers, Waltham, MA.

Patrick Sheridan holds the post of program manager for the U.S. Air Force at Hanscom AFB, MA.

Tim Stanley works for Digital in Maynard, MA.

Miguel Vassallo is employed as general manager at Vassallo Inc., Lake Wales, FL.

1983

MARRIED: Michael Brousseau and Sherri Ann Pitt in Connecticut on July 7, 1984. She graduated from Becker Junior College with an associate degree in accounting. He is employed by Digital Equipment Corporation. . . . **Howard Davidson** to **Lisa Moreau, '84,** in Sharon, MA, on August 18, 1984. Lisa works for American Management Systems, Arlington, VA, and Howard is with ITT-Dialcom, Silver Spring, MD. . . . **James Dolan** and Monique Gelineau in Mattapoisett, MA, on September 29, 1984. Monique, a health fitness specialist for the Hartford Insurance Group, graduated from UMass, Amherst. Jim works for Hamilton Standard. . . . **Chris Erikson** and **Karen Eklof, '84**, in East Greenwich, RI, on September 1, 1984. Karen is a project engineer at Procter & Gamble, Quincy, MA. Chris is a graduate student at MIT. . . . **Matthew Falco** and Orena Deveau in East Haven, CT, on September 29, 1984. Orena works for Coan & Bunnell Inc. Matthew is employed by MacDermid Inc. . . . **Christine O'Connor** and Michael Cataldo on October 7, 1984, in Worcester. She is employed by Computervision Corp., Bedford. Michael, who is with TDX Systems, Cambridge, graduated from Columbia University.

Michael Carroll

Homecoming '84: *Kathleen Devlin, sister of Patrick Devlin '86, of Norton, MA, gets fitted for Pat's football helmet with a hand from Mom, Mrs. Audrey Devlin.*

MARRIED: Robert Plante to Denise Christopher in Norwalk, CT, on September 7, 1984. She has a master's degree from UConn and has served as assistant director of school relations at California State University, Long Beach. He is a systems analyst for Parsons Co. in Yanbu, Saudi Arabia. . . . **Mark Robichaud** and Robin Richard in Fitchburg, MA. Robin, a medical technologist at Burbank Hospital, Fitchburg, graduated from Anna Maria College. Mark serves as a management engineer at International Medical Industries, Watertown. . . . **Derek Speed** and Jennifer Reardon in Dudley, MA, on June 9, 1984. Jennifer is a senior at Nichols College. Derek is a technical support specialist at DEC in Marlboro. . . . **Walter Towner, Jr.** to **Carolyn Kachanis** on September 1, 1984, in Providence, RI. Carolyn is operations manager of Compufab in Avon, MA, and he is operations manager of Thorsen Steel Products, also in Avon. . . . **James Welch** and Michelle Girouard in Spencer, MA, on September 15, 1984. She graduated from Anna Maria College and is employed at the Worcester County Convention and Visitors Bureau. He was recently named a senior systems engineer at Intellution Inc., in Westwood, MA. His responsibilities include project support and related activities.

Patricia Allard is an Edison Program engineer at GE Medical Systems, Milwaukee, WI.

Kimberly Berg was recently promoted to production engineer at Rockwell International Corp. in Duluth, GA.

Richard Cass works as an applications engineer at P/A Industries, Bloomfield, CT.

Martin Morra serves as a research assistant at MIT.

Joe Phelan, who has been with GE since graduation, has been transferred from the Pittsfield (MA) plant to the GE plant in Cincinnati, OH. Currently, he is in the management training program in the robotic engineering quality and production division.

Nicholas Pirog II works as a sales promotion coordinator at Analogic Corp., Danvers, MA.

David Sauerbrey has been transferred to San Antonio, TX, to assume the post of senior manufacturing engineer for the Isotronics Division of Augat Corporation. Previously, he was a production engineer for Augat in New Bedford, MA.

Mark Scott is now attending the University of Maryland as a full-time graduate student studying aerospace engineering in pursuit of his master's degree. Previously, he had worked for a year at Sikorsky Aircraft.

Paul Skerker is a graduate student in the School of Chemical Engineering at Cornell University.

1984

MARRIED: William Andrews, Jr. and Cheryl Spargo on August 4, 1984, in Amherst, NH. She attended Clark University, Worcester, MA, and Cambridge University in England, and she graduated from UNH with a BS in music education. He works for NBI in Boulder, CO. . . . **Frederick Groll** to Claire Connor in Northboro, MA, on June 16, 1984. An occupational therapist, she graduated from Boston University and Sargent College of Allied Health Professions, Boston. Groll, who has his MSEE from WPI and graduated from Boston University College of Engineering, is employed at DEC. . . . **Thomas Levergood** to Fran Jurgrau on June 23, 1984, in Framingham, MA. Fran graduated with a degree in psychology and elementary education from Southeastern Massachusetts University. Tom works for DEC in Maynard. . . . **Philip Litchfield** to Trayce Taras in Worcester on June 23, 1984. She graduated from Fitchburg State and is a kindergarten teacher in Derry, NH. He works for RCA, Burlington, MA.

MARRIED: Michael McInnis and **Donna McRae** in Worcester on June 16, 1984. Donna is employed by RCA and Michael by Sanders

Can't Get Around to It? Call Bruce Jacobson

How many times have you said, "I'll do it when I get around to it," and "it" never gets done? Well, Bruce Jacobson '80 ME has designed just the thing for procrastinators, "a round tuit" that you can carry right in your pocket.

Bruce, who is general manager of Photopanels of New England Inc., Princeton, MA, and who has an interesting sense of humor, designed the metal disk as a trade show giveaway to illustrate his company's unique photo process.

Last year, Bruce came up with another popular giveaway with roots right on the WPI campus—a round ruler. "Prof. Hal Corey, in questioning the length of a line on a mechanical drawing, would place a finger at each end of the line and say the line was 'yea long', hence, 'yea long' was always the right length," he says. Bruce's round ruler, or "Yea Gage," is as long as it needs to be, with every revolution representing 10 inches.

According to Bruce, Photopanels, which was founded by his father, Burton, in 1963, was the second authorized processor in the country using the process whereby a photographic image is embedded and sealed within the surface of anodized aluminum. The panels withstand extreme wear and high temperatures, will not peel, are impervious to salt spray and are unaffected by organic solvents, oil or grease. The process is used, among other things, for custom machine control panels, instruction panels, data plates, dial faces and outdoor signs.

Roger Perry '45

Jacobson and "Yea Gage".

"Some of our panels are on submarine decks and in use on space shuttles," Bruce says. They are used by industries in Detroit and by companies such as Heald, Norton and Raytheon in Massachusetts. They are also on the new dedication plaques in Washburn Shops at WPI. Washburn is a fitting site for Photopanels: Bruce's grandfather, Enoch Sandstrom, once taught there.

Bruce is vice president of the Princeton Businessmen's Association, a captain with the town fire department and an emergency medical technician.

"I had a happy emergency last spring," he reports. "I brought a baby girl into the world right in the hospital parking lot!"

Associates. They reside in Nashua, NH. . . . **Kenneth Nylen** and Janet Driscoll in Duxbury, MA, on September 15, 1984. Janet, an RN at UMass Medical Center, Worcester, graduated from St. Vincent Hospital. Ken has been working on the energy management project at DEC, Northboro. . . . **Timothy Proch** and Victoria Fazo in Southington, CT, on August 12, 1984. Victoria graduated from Western Connecticut State University with a degree in elementary education. Timothy is with IBM in Boca Raton, FL. . . . **John Roberts** and Iris Papaioanou in Haverhill, MA, on June 23, 1984. She graduated from Bates College, Lewiston, ME. He works for RCA, Burlington, MA. . . . **Richard Testa, Jr.** and Donna Lee Stetson in Natick, MA, on August 11, 1984. She graduated from UMass, Amherst, and is currently a graduate student at Northeastern. He is a graduate student at MIT.

MARRIED: Roger Uszakiewicz to Lori Zemeir in Naugatuck, CT, on September 8, 1984. Lori holds a degree in physical therapy from Russell Sage College. Roger works for Turner Construction Co., New York City. . . . **Douglas Valentine** to Allyson Twomey in East Brookfield, MA. Allyson is a student at Assumption College, Worcester, and Douglas an assistant pharmacist for Pfizer Pharmaceuticals. . . . **Paul Vanslette** and Cynthia Chapman in Medfield, MA. Cynthia is employed at Digital. Paul works at Intellution. . . . **David Viens** and **Nancy Zimmerman** on August 18, 1984, in Barrington, RI. Nancy works for GE and David for Procter & Gamble. . . . **David Wesche** to Wendy Larson in Shrewsbury, MA, on July 27, 1984. Wendy attended Becker and is a secretary at Norton Co. David is supervisor of personal computer software manufacturing at DEC, Northboro.

Carl Benda continues as a graduate student in the ME department at WPI.

Lawrence Bis works for Westinghouse Electric Corp.

Stephen Breininger has been employed by GenRad.

Paul Bresten is a graduate teaching assistant in the EE department at WPI.

Michael Briere is with IBM.

David Brin has been named to the staff at Westinghouse Electric Corp.

Karen Brock has been employed by General Electric.

Harold Broker is with IBM.

Robin Brown works for Raytheon Company.

Paul Brozek is studying at UMass.

Robert Bunce has been employed as a test equipment engineer by IBM in East Fishkill, NY. He is directly involved with the design of state-of-the-art computers for testing semi-conductor devices.

Jeffrey Burdick works for IBM.

Randy Burnham is with Mitre Corporation.

Scott Burton has joined American Telephone & Telegraph.

James Cadman has been employed by Data General.

Ronald Caldwell works for IBM.

Fabio Carrera has been employed by BTU/Bruce Corp.

John B. Carroll is a nuclear engineer and an officer in the U.S. Navy.

John P. Carroll works for DEC.

John Casey has been employed by Mitre Corporation.

John Cassidy has joined IBM.

Christine Cataldo is employed by General Electric.

Loring Chadwick is serving with the U.S. Air Force.

Lee-Anne Charbonneau serves as an associate engineer at Westinghouse Electric Co., Annapolis, MD.

Laurence Chin works for Data General.

Robert Chin has been employed by Teradyne Inc.

Pyong Tae Chong has joined AT&T Teletype.

Todd Cimino is with Schlumberger Well Service.

Laurie Cocchi works for Westinghouse.

David Coffin is currently with the Raytheon Company.

Mark Coggeshall has been employed by Data General.

Brian Coleman serves with the U.S. Army.

Kevin Collamore is serving with the U.S. Air Force.

Raymond Comparetta is now with Daniels Construction Co.

Kevin Conlon has been employed by Data General.

Susan Coombs holds the post of programmer for decision support evaluation at IBM in White Plains, NY.

Karen Crall works as a research chemist at Sanncor Industries in Leominster, MA.

Steven Criscione has joined the Charles Stark Draper Lab.

Kathy Cronin is a student at Virginia Tech.

Brian Cull is now with GE.

Catherine Culnane has been employed by American Management Systems.

Matthew Cummings works for EPSCO Inc.

Michael Curtin works for Raytheon Company.

Gayle Dalawrak is with the U.S. Air Force.

Cathryn Dalton works for General Electric.

Bruce Daube is studying at California Institute of Technology.

Elenora Davies serves as a technical systems programmer for Paul Revere Insurance, Worcester.

Jennifer Davis has joined Engenics.

Karen DeGrace works for BETAC Corp.

John Delaney is at Rockefeller University.

Robert DeMattia is with the Department of Defense, Ft. Meade, MD.

Kenneth Dieselman works for the American Hospital Supply Corporation.

Gianni Dintino has been employed by Consolidated Edison.

Michael Dowd holds the post of product

manager at Wright Line in Worcester. He has an AB from Assumption College.

Randall Drabczuk is serving with the Air Force.

Gregory Durand has joined General Dynamics' Electric Boat Division, Groton, CT.

David Dymek is a systems engineer at Hewlett-Packard, Andover, MA.

Maura Eagen is on the staff at Norton Co.

Brett Edelson works for Data General.

John Ekberg is a supervisor for DEC in Littleton, MA.

Daniel Farrar works for GE.

Brett Feddersen is studying at the University of Illinois.

Alan Feitelberg is at MIT.

Andrea Fielding was recently employed by Hughes Aircraft Co.

Michael Fields has joined Raytheon.

Stephen Fiorelli has joined the staff at IBM.

Tim Fitzpatrick is studying for his MS at Stevens Tech. He resides in Allendale, NJ.

Timothy Fitzsimmons continues as a grad student at WPI.

Glenn Flanigan works for Raytheon.

Mary Foley has been employed by AT&T Technologies.

Jeffrey Forsythe is now with Digital Equipment Corporation.

Paul Fortier has been employed by Clairol.

Joseph Fortunato is a graduate student at the Polytechnic Institute of New York.

John Foundas has been employed by Raytheon Company.

John Franzini is employed by the Naval Underwater Systems Center.

Daniel Fretz works for RCA.

Tracy Gamble has joined Hamilton Standard.

Charles Garland has accepted a post with Procter & Gamble Company.

Daniel Genis is with Westinghouse Electric Corp.

Victor Geraci works for United Nuclear Corp.

Michael Gilbert works for General Dynamics' Electric Boat Division.

Paul Gingrich, who has his MS in computer science from WPI, is currently with Schlumberger Research Corp., Ridgefield, CT, where he is involved in research on new software for the company's oilfield services.

Lawrence Glennon II works for AVCO Systems Division.

Paul Graham, Jr. is employed by New England Power.

Derek Granquist is on the staff at Raytheon Company.

Paul Grautski is now with The Gillette Co.

Frederick Gummow works for IBM.

Jeffrey Gwynne has joined Bell Labs. He holds an MSEE from WPI.

James Hagerott has accepted a post with Schlumberger Well Services.

Greg Hagopian works for McDonnell Douglas Corp.

Richard Hajec has joined AT&T.

David Hall is in the manufacturing management program at General Electric in Syracuse, NY.

Harry Hall serves as a programmer at IBM in Owego, NY.

Steven Hall is on the staff of Schlumberger Well Services.

Philip Hallee has accepted a post with GenRad.

Nicholas Hannon is on the staff at IBM.

Paul Harriman works for Manufacturer's Business Systems.

Sandra Harris is studying at UMass.

Deborah Harrow serves as a systems engineer for IBM in Savannah, GA.

Robin Hart is employed as a manufacturing engineer at Digital in Marlboro, MA.

Gregory Hauck is a member of the technical staff at Mitre Corp., Bedford, MA. He has a BS in engineering science and math from Regis College, Denver, CO.

George Hayeck continues as a full-time MBA student at WPI.

John Henderson works for Camp Dresser & McKee.

G. Christopher Heyl has accepted a post with the firearms division of Colt Industries.

Dean Holman is now with Mitre Corporation.

William Holman works for Teradyne Inc.

Paul Holmes is with Fairchild-Weston systems.

Jack Holzman holds the post of associate engineer at General Dynamics' Electric Boat Division, Groton, CT.

Roy Hopgood continues with Alloy C.P.D.

Paul Huehmer works for Computervision.

James Huffnagle has been employed by RCA.

Peter Hunt is working for Stone & Webster.

Scott Hunt is now at Newport News Shipbuilding.

Robert Hunter is with Sanders Associates.

William Hyland has been employed as a product engineer at Teradyne, Nashua, NH.

Natural Science Program

Robert Raymond, '79, is starting his 16th year as a chemistry teacher in the science department at Mahar Regional School in Orange, MA. . . . **Francis Gingras, '81,** has retired as a science teacher at Gardner (MA) High School following 16 years of service.

School of Industrial Management

Charles Adams, '55, director of procurement for Wright Line Inc., Worcester, was recently elected president of the Purchasing Management Association of Worcester. He has served the group as vice president, director and chairman of the professional development committee. In 1981, he earned the professional designation of certified purchasing manager. . . . **Stephen McCabe, '64,** serves as executive vice president of J.C. Carter Co. in Costa Mesa, CA.

Richard Alliegro, '67, has been elected vice president of high-performance ceramics by Norton Co., Worcester. He is responsible for the overall management of the firm's high-performance ceramics business unit. Previously, he had been divisional vice president and general manager of U.S. operations for the industrial ceramics business unit. He graduated from Alfred University's College of Ceramics with bachelor's and master's degrees in ceramic engineering. Throughout his Norton career, he has been involved in the development of new business opportunities for the Industrial Ceramics Division. Some of these were armor used in military aircraft protection; Crystar, which is used in diffusion components in the electronics field; igniters and ceramic kiln furniture. Besides WPI's School of Industrial Management, Alliegro attended the Advanced School of Management at Northeastern University.

COMPLETED CAREERS

George E. Chick, '13, the retired treasurer of John F. Chick & Son Inc., died at the Fryeburg (ME) Health Care Center on June 16, 1984, following a short illness.

He was born on Sept. 10, 1891, in Silver Lake, NH. Graduated with his BSME from WPI, he spent his entire career with John F. Chick & Son, a lumber company in Madison, NH, where he had been a partner, proprietor, president, general manager and treasurer.

Mr. Chick was a past master of his local Masonic lodge, a charter member of the Ossipee Rotary Club and a past director of the Northeastern Retail Lumber Dealers Association. He was a past president of the New England Architectural Woodwork Institute and of the Carroll County YMCA, which he had also served as original director. He belonged to ASME, the Baptist Church and Lambda Chi Alpha.

Albert J. Lorion, '13, a retired industrial engineer, died in Morristown, NJ, on July 10, 1984. He was born in Worcester on Oct. 9, 1891, and he received a BSCE from WPI.

During his career, he was with the Freight Container Bureau, the Grand Trunk Pacific Railroad, Cambria Steel Company, and Westinghouse, Church, Kerr & Co. At one time, he was traffic manager for C.P. Perin-S.M. Marshall, consulting engineers. He retired as an industrial engineer from Uniroyal Co. He had served as a lieutenant colonel in the U.S. Army.

A member of Tau Beta Pi and Sigma Xi, Mr. Lorion had also belonged to the Montclair Engineers Society. He was a former vice president of the New York chapter of the Alumni Association.

Arthur W. Knowlton, '14, of Rockport, MA, died on April 14, 1984. He was born in Boston on Sept. 2, 1890.

A graduate civil engineer, from 1914 to 1921, he was with the Boston & Maine Railroad. From 1921 to 1961, when he retired, he was employed by Tredennick-Billings Co., Boston. He belonged to Phi Sigma Kappa, the Boston Society of Civil Engineers and the Masons. He was the father of **Donald Knowlton, '51.**

Dick G. Wong, '16, passed away in Providence, RI, on March 22, 1984. He was 89 years old and a native of San Francisco.

Robert W. Stoddard

(Editor's note: Shortly before press time, the college and the community learned of Mr. Stoddard's death. Thus the brevity of this notice.)
Robert W. Stoddard, a WPI trustee emeritus, chairman of the Worcester Telegram & Gazette Inc., former chairman of the board of Wyman-Gordon Co., and a founder of the John Birch Society, died December 14, 1984, at his home in Worcester. He was 78.

Mr. Stoddard served as a WPI trustee from 1941 to 1946, was named a life trustee in 1952 and a trustee emeritus in 1980. In 1952, he received an honorary doctorate from the college. (His father, Harry G. Stoddard (1873–1969) was awarded an honorary doctorate from WPI in 1941.) The Stoddard family gave major support for construction of WPI's Stoddard Residence and is responsible for the Stoddard Professorship in Management.

Besides his doctorate from WPI, Mr. Stoddard held honorary degrees from Assumption College, Worcester, and Piedmont College, Greenwood, SC. He was born in Trenton, NJ, in 1906.

Robert Stoddard was a successful businessman, community leader and philanthropist. He succeeded his father as president of Wyman-Gordon, had served as chairman of the Worcester Airport Commission, and as a director of numerous institutions including the First National Bank of Boston, the International Paper Company and Raytheon Company. He had been a trustee of the Worcester Foundation for Experimental Biology, Worcester Academy and the Worcester Art Museum.

As his father gradually retired from active responsibility for the *Telegram* and *Gazette*, Robert Stoddard's role became more significant. In 1963, he was named chairman of the board of the newspapers. He was strongly committed to maintaining the Worcester newspapers and Radio Station WTAG under local control and ownership and for keeping editorial policy entirely separate from news reporting, while remaining conservative politically.

Mr. Stoddard, a graduate of Yale University and Harvard Business School, retired as chairman of the board of Wyman-Gordon in 1972 after 43 years with the company. He was named honorary chairman of the company's board of directors. Wyman-Gordon is the Western world's largest supplier of forgings to the automotive, aerospace and gas turbine industries.

In 1958, Mr. Stoddard became one of the founders of the John Birch Society, serving as a member of its council and executive committee. He was a firm believer in the strengths of the American economic system and a leading proponent of free enterprise.

As a philanthropist, Mr. Stoddard was a strong supporter of the Boy Scouts of America, and was a recipient of the Silver Beaver Award, the highest honor granted by the Boy Scouts for service by adult leaders to youth. He was a prime benefactor in the growth of the Worcester Science Center. An avid big-game hunter, he donated many specimens to the science center for its African exhibit, regarded as the finest of its kind in the country.

Mr. Stoddard also enjoyed flying, photography and travel, but he claimed that salmon fishing was his first love. He belonged to the First Baptist Church, the American Antiquarian Society, the Worcester Club, Worcester Country Club and Tatnuck Country Club. His grandson Thomas Loring is a member of the WPI Class of 1988.

WPI and the Worcester community have lost a leading friend of education, science, the arts, philanthropy and commerce. We join his family, friends and colleagues in mourning his death but rejoice with them in his memory.

Mr. Wong owned the former Hong Hong Restaurant, now the Players Corner Pub, in Providence for 40 years prior to its closing in 1970.

Louis E. Jacoby, '17, of Woodmere, Long Island, NY, died on March 26, 1984, at the age of 88. He was born on Oct. 12, 1895, in New York City. He studied civil engineering at WPI.

For many years, he was a sales executive with Century Industries Inc. of New York, retiring in 1970. He was a member of Theta Chi.

Clarence B. Tilton, '17, a former ceramics engineer for Norton Co., died in Ravenna, OH, on June 4, 1984. He was 90 and a Fitchburg, MA, native.

He graduated as a chemist from WPI and soon joined Norton's research lab in Worcester. In 1918, he was with the Chemical Warfare Service. From 1919 to 1937, he was vice president and general manager of Cortland Grinding Wheel Corp. and from 1937 to 1948, he held the same posts with the Safety Grinding Wheel & Machine Co. He had been assistant to the president and research director at Simonds Worden White. In 1959, he retired.

He was a member of both the Dayton and Springfield (OH) engineering societies and a former vice president of the Clark County TB and Health League. He belonged to the Executives Club and to Sigma Phi Epsilon.

Ernest Thompson Jr., '20, former chief engineer at Wilputte Coke Oven Corp., died in Worcester on August 26, 1984, at the age of 86. He was a Worcester native and a graduate civil engineer from WPI.

During his career, he was with McClintic-Marshall, Morgan Construction and Koppers Construction. From 1937, until his retirement in 1962, he was chief engineer for Wilputte Coke Oven Corp., a division of Allied Chemical Corp. in New York City.

Mr. Thompson, brother of **Lincoln Thompson, '21**, belonged to Phi Sigma Kappa, Tau Beta Pi and the Salem Covenant Church. He was a veteran and subsequently served in the Army Reserves.

C. Freeman Hawley, '23, a longtime employee of Riley Stoker Corp., Worcester, died in Worcester on August 7, 1984, at the age of 82. A native of Brattleboro, VT, he was a graduate mechanical engineer from WPI.

In 1967, he retired as chief mechanical engineer at Riley Stoker, Worcester, following 44 years of service. He belonged to Theta Chi, Tau Beta Pi, the Tech Old-Timers, the Worcester Engineering Society, ASME, the Massachusetts and New York societies of professional engineers and the Worcester County Mechanics Association.

Mr. Hawley was the father of **Bradford Hawley, '51,** and the grandfather of **David Hawley, '78.**

Gifford T. Cook, '28, of Harpers Ferry, WV, an internationally known fire prevention engineer, passed away last summer. He was born in Fall River, MA, on Sept. 11, 1907. He received his BSCE from WPI.

During his career, he was a fire prevention engineer for the National Board of Fire Underwriters in Chicago; assistant manager of the International Association of Fire Chiefs, New York City; and a fire prevention engineer for the U.S. War Department, office of the chief engineer, Washington, DC, and later with the U.S. Air Force, also in Washington.

In 1946, he was awarded the Emblem for Meritorious Civil Service by the War Department in recognition of his services as chief of the fire prevention section, air installations division, Army Air Forces (AAF). He was cited for the reduction in fire losses within the AAF because of his success in perfecting the AAF's organization and for his training of fire prevention and protection personnel.

A registered professional engineer in Wisconsin, he was also a member of the Federal Fire Council, the President's Conference on Fire Prevention, the National Fire Protection Association and the American Society of Fire Protection Engineers. He belonged to ATO, Skull and the Poly Club, and he had served as class secretary. Last winter he and his wife, Marianne, spent 86 days skiing in Austria.

Edward N. Wooding, '28, of Hamden, CT, passed away on May 22, 1984. He was born on June 9, 1905, in Wallingford, CT, and he studied mechanical engineering at WPI.

After two years with Henry R. Kent Co., Rutherford, NJ, he worked for the Central Cold Storage Corp. of New Haven, CT, first as manager, then as president-owner. He retired in 1975.

Mr. Wooding belonged to Lambda Chi Alpha. Active with the Rotary club, the Masons, and the local library, he also served 20 years as treasurer of his church.

Whitney F. Schuka, '30, a longtime employee of the Newport (RI) Naval Base, died in Weymouth, MA, on July 24, 1984. A Worcester native, he was born on Dec. 7, 1908.

A graduate civil engineer, during his career he was with Fred T. Ley & Co. and the Rural Electrification Survey in Worcester. For many years, he was associated with the U.S. Navy Public Works Center in Newport, RI, as well as with the Navy's ammunition depot in Hingham, MA. From 1941 to 1951, he was a civilian assistant to the manager of all Navy projects at the Boston Navy Yard.

In 1972, he was named building commissioner in Hingham, MA. He belonged to Sigma Xi.

C. Stanley Brewer, '33, a veteran employee of the New England Power Company, died on July 12, 1984, in Hanover, NH. He was 73 and a native of Worcester.

Following his graduation as an electrical engineer, he joined New England Power Co. In 1974, he retired as superintendent of the hydro division after 40 years of service. He was a professional engineer in Massachusetts. An active member of the Congregational Church and the Shrine, he also had served as master of the Masonic Lodge in Shelburne Falls, MA. He belonged to Phi Sigma Kappa.

Walter J. Kowal, '34, died June 13, 1984, at the University of Massachusetts Hospital in Worcester. He was 72. A native of Spencer, MA, he graduated from WPI with a BSME.

Prior to retiring in 1972, he had been a metallurgist at Lombard Governor Corp. in Ashland for 29 years. At one time, he was with Morgan Spring Co., Worcester. He was a member of Our Lady of Czestochowa Church.

Charles R. Varney, Jr., '34, passed away at his home in North Brookfield, MA, on June 24, 1984, at the age of 72.

Until retiring several years ago, he owned and operated Varney's Electrical Service Inc. since founding the firm in 1947. Previously, he owned Varney's Radio & Electrical Shop. During World War II, he was in the Navy.

Mr. Varney had served on the town board of library trustees and on the town finance board. He belonged to the Massachusetts Electrical Contractors Association and Meridian Sun Lodge of Masons.

Edward E. Turner, '38, who was retired from Hughes Aircraft after 22 years of service, died on May 9, 1984. He was born in New Haven, CT, on June 10, 1916.

In 1938, he received his BSME from WPI. After working for Seamless Rubber, the New Haven Railroad and Austad Steel, in 1952 he joined Hughes Aircraft, Tucson, AZ, where he served as plant engineer. A registered professional engineer in Arizona, he also belonged to Phi Sigma Kappa and the Poly Club.

Lawrence C. Neale, '40, an internationally known hydraulic expert and former professor of mechanical engineering and director of Alden Research Laboratories at WPI, died in St. Louis, MO, on October 24, 1984, while on a business trip.

He was 66, a native of Wayland, MA, and a graduate civil engineer from WPI. In 1958, he received his MSME.

After leaving WPI in 1975, Prof. Neale joined Chas. T. Main Inc., Boston, as chief flow specialist and chief hydraulic engineer. He was with the international consulting engineering firm at the time of his death.

In 1940, he joined the WPI faculty as an instructor at Alden Hydraulic Laboratory, where he conducted studies in river models, structural models, flow calibrations and machinery studies. In 1950, he was named assistant director of Alden Research Laboratory; he was named assistant professor in 1957, a director of the laboratory in 1968 and a professor in 1965.

At Main, he dealt with hydraulic aspects of design, including hydraulic problems experienced during construction and operation. He was concerned with spillways, energy dissipation, shore protection, thermal plumes and flow measurement. His field testing included hydraulic turbines, pumps, flow and ocean current surveys and inspections of hydraulic equipment in North America, Europe and Asia. He was a registered professional engineer in Massachusetts.

Prof. Neale taught courses at WPI in fluid mechanics and aided in thesis work for advanced engineering degrees. At Alden Laboratories, he was responsible for all activities, including model studies of thermal effects from condenser discharge

Fluent in French and Russian, Prof. Neale served as U.S. representative for the International Electrotechnical Committee and was a member of the board on Performance Test Codes, the Fluid Meters Committee and the International Standardization Committee, all for the ASME. He was a fellow of the ASME and the ASCE, as well as a director of the Boston Society of Civil Engineers and a member of the International Association of Hydraulic Research and of the American Geophysical Union.

He was honored as a John R. Freeman fellow in 1954 and 1955 and received the Worcester Engineering Society Scientific Achievement Award in 1974 and the ASME Centennial Award in 1980. The author of numerous engineering publications, he belonged to Sigma Xi, Pi Tau Sigma, Chi Epsilon and Lambda Chi Alpha.

In World War II, Prof. Neale served in the Pacific and the Philippines with the U.S. Navy, later retiring from the Navy Reserve with the rank of lieutenant commander.

Alan N. Sanderson, '43, of Houston, TX, passed away recently. A native of Milton, VT, he was born on Oct. 15, 1922. He was a graduate chemical engineer.

During his career, he was with the U.S. Army Air Corps from 1943 to 1947, then served many years as principal meteorologist with the U.S. Weather Bureau and as chief of spaceflight meteorology at the NASA Manned Spacecraft Center in Houston. He was a member of the American Meteorological Society and Lambda Chi Alpha.

Bernard L. Beisecker, Jr., '46, died in Warwick, RI, on July 5, 1984, following a long illness. He was 59.

A native of Ellwood City, PA, he later graduated as an electrical engineer from WPI. In 1959, he graduated from WPI's School of Industrial Management. During his career, he was vice president of manufacturing at Reed & Prince Co., Worcester, and vice president of Microdot Inc., Frankfort, KY. He retired in May as vice president of manufacturing at Industrial Fastener, Long Island, NY.

Mr. Beisecker, a Mason, and a member of Lambda Chi Alpha, was a lieutenant in the U.S. Navy in World War II. He was the father of **Wayne Beisecker, '78.**

Walter D. Allen, Jr., '49, a marketing executive, died July 9, 1984, at his home in Glastonbury, CT, at the age of 59. He was born in Worcester.

A graduate mechanical engineer, for many years he was an executive in the marketing division at Pratt & Whitney Aircraft Division of United Technologies in East Hartford, CT. He belonged to Sigma Phi Epsilon, the Congregational Church, the Connecticut Parachuting Corp., ASME and the American Society of Experimental Test Pilots. An Army Air Corps veteran of World War II, he also served in Korea.

Robert R. Atherton, '50, of Jupiter, FL, passed away on July 7, 1984. Born on July 4, 1927, he was a native of Pittsburgh, PA, and received his BSME from WPI.

From 1950 to 1955, he was with Westinghouse Electric Corp. For many years he was an employee of Pratt & Whitney Aircraft, in East Hartford, CT, and West Palm Beach, FL. He served as a project engineer and manager for the firm.

Mr. Atherton belonged to SAE, Sigma Xi, ASME and the American Rocket Society.

Alexander T. Cyganiewicz, '50, chief estimator at S.J. Curry & Co., Albany, GA, died on June 23, 1984. He was born in Gardner, MA, on Feb. 26, 1918.

In 1950, he graduated as a civil engineer from WPI. Prior to joining Curry, he had been associated with the Massachusetts State Highway Dept. and J.B. Lowell Inc., Worcester. He served in the Army Air Force for six years and was discharged as a lieutenant colonel.

Stuart P. Roberts, '60, founder and president of S&S Electronics Inc., Lowell, MA, died July 15, 1984, in Concord, MA. He was 46, a native of Lakewood, OH, and a graduate electrical engineer.

During his career, he was with General Radio Co., Non-Linear Systems and Wang Laboratories. In 1970, he founded S&S Electronics. He was a 32nd-degree Mason and a former trustee of the Methodist Church of Westford. Other memberships were with the National Rifle Association, the Boat Owners' Association of the United States and Lambda Chi Alpha.

A talented musician, he was a member of the Chelmsford Community Band and also participated in jazz concerts. He was a licensed ham radio operator, as well as a licensed pilot. He was the brother of **Alan Roberts, '63.**

William A. St. John, Jr., '83, died recently. He was born in Holyoke, MA, on Jan. 26, 1961. In 1983, he graduated with his BSEE from WPI.

He was a customer service engineer for Hewlett-Packard Co., Colorado Springs, CO, and belonged to Tau Beta Pi and Eta Kappa Nu.

FEEDBACK

On Rainbows

Editor:

Re: The interesting article on rainbows, especially the last paragraph, page XI, in the August 1984 issue.

I am reminded of the passage in the Bible, Genesis Chapter 9, where Noah was extricating himself from the flood.

God said as recorded in verses 14–18 that he would establish the rainbow as a covenant that there would be no more floods.

Perhaps this helps explain the continuing questions to which Mr. Lee refers.

Allen H. Gridly Jr., '38

Syracuse, NY

Editor:

An editorial error has been introduced into my article on rainbows (August 1984

issue): It is not true that "at each bounce, 94 percent of the ray's energy is refracted out of the drop" (page IV). The amount of light refracted or reflected by a raindrop is not constant. Among other things, it depends on the angle at which a light ray meets any air-water boundary.

In addition, I disagree with several of Ed Thorsett's "Photographing Tips."

You should not always underexpose rainbow pictures, as he advises in tip (1). Apparently, Mr. Thorsett is referring to the fact that the interior of the main bow may appear considerably brighter than the background. However, this is not always the case. His best advice is in tip (2): bracket your exposure.

Neither Alistair Fraser nor I recommend you abandon your polarizing filter when photographing rainbows (tip 5). Although these filters will reduce the intensity of the bows (the amount depending on the filter's orientation), you can partly compensate for this when setting the exposure. The important point here is that rainbow light is itself highly polarized. Far from being a disadvantage, a polarizing filter can let you see new subtleties. Case in point: some of the photographs appearing in the article were shot using a polarizing filter.

Finally, as nearly as we can tell without examining the original photograph, Mr. Thorsett may have given you a sample of lens flare, not a rainbow. Note that the red is toward the inside of the arc, that the waterfall is not sunlit, and that the scene appears to be backlit.

In any event, I hope your readers will find that both natural bows and artists' bows can be great fun to study. If they have any questions about either, they may write to me.

Raymond Lee, Jr.
Meteorology Department
Pennsylvania State University
University Park, Pennsylvania 16802

Higgins House Revisited

Editor:

Kudos to Lora Brueck for her excellent story on the Higgins House (August 1984). As a member of one of the early classes to occupy Goddard Hall, I can recall looking out from the top floor to a partially obscured view of Higgins House, wondering about its unique architectural and mystical qualities. Ms. Brueck has unraveled the mysteries in an enjoyable narrative and pictorial which melds history and art.

John B. Feldman '67
Lexington, MA

AMPERSAND

The End of Blah Weekends

Had your fill of weekends that revolve around Sunday afternoon TV sports? Wish there was a way of getting away for a relaxing weekend where you'd meet other alumni—and learn something in the bargain?

WPI's new "Weekender Program" may be the answer. Between now and May, alumni, spouses and friends can attend any of three weekend getaways on Cape Cod, in Vermont or in Maryland. Chosen for their excellence and charm, each Weekender location provides a welcome setting for good fellowship, educational stimulation, relaxation and recreation. Some locations are quaint and historical, others simply luxurious.

Friday and Saturday evenings, you'll dine and catch up on what's happening on the Hill. Saturday morning will find you at the theme program, interacting with experts in emerging fields of science and technology. Saturday afternoon, you're on your own for tours of the area, recreation, shopping, relaxation—whatever. And at Sunday morning brunch, you'll view "Washburn: The Tradition Restored," a multimedia slide show depicting the history and dramatic restoration of Washburn Shops, rededicated in October 1984.

Here are the dates, themes and locations of upcoming Weekenders:

March 8–10, 1985
"Frontiers of the Sea"
Marine Biological Laboratories
Woods Hole, Massachusetts
At one of the nation's leading centers for oceanography and marine biology. Dr. Ronald Baird, a marine biologist and director of Corporate Relations at WPI, will host this fascinating session. You'll also tour the Laboratories' outstanding experimental facilities and the town of Woods Hole.

April 19–21, 1985
"Spring Bursts Forth"
The Woodstock Inn
Woodstock, Vermont
A special opportunity to experience the photography of WPI's George Schmidt—and to hear his tips on the techniques that produce his feasts for the eyes, at one of New England's most celebrated inns, during the springtime in Vermont.

May 10–12, 1985
"Technology and Medicine"
Historic Inns of Annapolis
Annapolis, Maryland
You'll see how technology is changing the practice of medicine, from WPI Professors Joseph Bagshaw and Robert Peura and faculty from Johns Hopkins University and the University of Massachusetts. And Annapolis in May is spectacular.

Prices for WPI Weekenders include lodging, meals, taxes and gratuities.

Find out more about WPI's new Weekenders, and start attacking Mondays refreshed—and better informed, too.

Please send me details for the following Weekender(s):

_____ **Marine Biological Laboratories**
March 8–10, 1985
$90 per person double occupancy
$120 per person single occupancy

_____ **The Woodstock Inn**
April 19–21, 1985
$190 per person double occupancy
$265 per person single occupancy

_____ **Historic Inns of Annapolis**
May 10–12, 1985
$180 per person double occupancy
$245 per person single occupancy

If you wish, make reservations now by enclosing a check for $_____ ($25 per person per Weekender) for reservations. (Checks payable to *WPI Weekenders*)

Name _____ Class Year _____

Address _____

State _____ Zip _____

Telephone (home) _____ (business) _____

Return to:
WPI Weekenders Program
Office of Alumni Relations
Worcester Polytechnic Institute
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WPI Journal

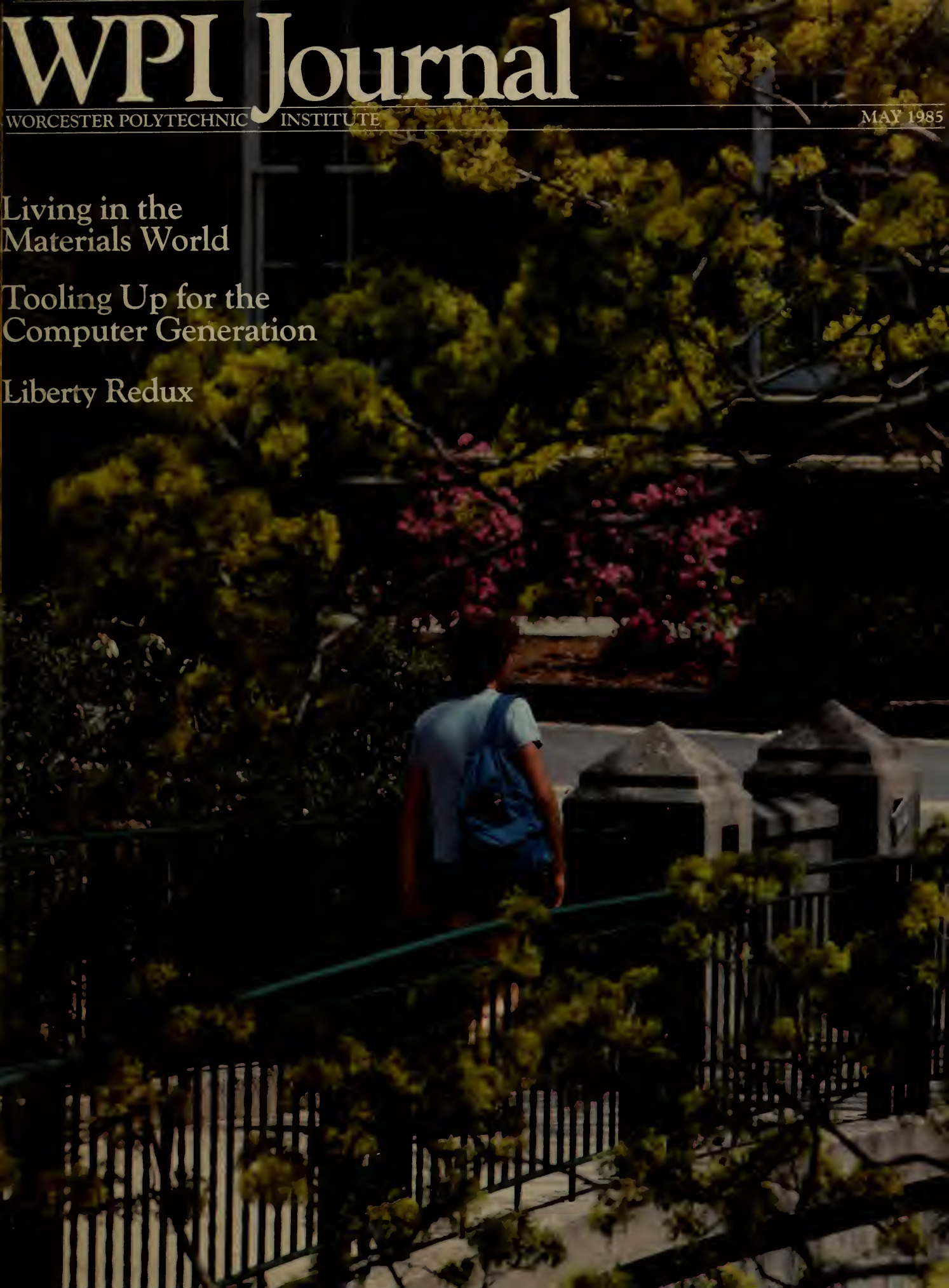
WORCESTER POLYTECHNIC INSTITUTE

MAY 1985

Living in the Materials World

Tooling Up for the Computer Generation

Liberty Redux



A MESSAGE

From Harry W. Tenney, Jr. '56
WPI Alumni Association President

It's not often that we step back to reflect on an important sphere in our lives. As my term as president of the Alumni Association approaches its end in June, this occasion to report to you gives me just such an opportunity.

The past two years represent an eventful period in the history of the WPI community. And in the last decade and a half, more meaningful changes have occurred at WPI than in perhaps any other similar era in the evolution of the college.

Beginning in the early 1970s with the inception of WPI's bold, innovative educational program, the WPI Plan; to the college becoming a coeducational institution at about the same time; to renovations of Salisbury Laboratories, Boynton Hall, Atwater Kent Laboratories, and, last year, the Washburn Shops, the past 15 years have in many ways rebuilt the foundations of the WPI many of us knew as undergraduates.

Still, for all this change, WPI today is far stronger and more responsive to the demands of technology and society than it has ever been. The decisions to rechart WPI's course were indeed invested with foresight and the wisdom of experience.

The "performance" of the alumni body and the Association, too, set new marks for excellence in this period.

The number of alumni, for example, has grown from about 10,000 in 1973 to more than 16,000 in 1985, and the median class has shifted from 1954 to 1969. Today the "average" alumnus is about 37 years old. But more significantly, the contribution of alumni, both financially and through personal involvement in support of WPI and its programs, has been nothing short of phenomenal.

Consider this:

• In the last decade, Alumni Fund contributions have grown from $237,000 to, for the first time, over $1 million in 1983–84. At the same time, alumni participation increased from 33 to 41 percent.

Because of this growth, WPI has received five prestigious U.S. Steel/CASE (Council for the Advancement and Support of Education) awards in the past six years, and a total of six of these prizes, a record bettered by only one other college in the country.

• The Alumni Admissions program—just nine years old—has grown to where more than 400 alumni contacted 1,295 prospective students in 1984. This program is active in 31 areas throughout the country and in Puerto Rico. It is an effort that is particularly vital to WPI's future, considering the discouraging demographic projections for high school students in the coming decade.

• In the past two years, advisory committees have been formed by WPI to serve several academic departments. Alumni are playing central roles in this important activity.

• Alumni attendance at Homecoming and Reunions is at an all-time high, with no drop in sight.

• Revitalized in 1982, the Student Alumni Society (SAS) today involves 115 undergraduates. This popular program has been instrumental in restoring many WPI traditions and in creating new ones. Read more about this exciting program on page 41 of this issue of the *Journal*.

• Activities in 26 regional clubs across the country continue to provide yet another vehicle through which WPI alumni can stay in contact with the college and their fellow graduates.

• Since joining the Johns Hopkins University-based Alumni Magazine Consortium, a seven-college cooperative publishing venture, in 1982, the WPI *Journal* has undergone continuing improvements in format, content and quality.

• Regularly published alumni newsletters from nine academic departments are an important addition to communication between WPI and its graduates. So is WPI *In Print*, which highlights the extensive and growing media coverage of the WPI community.

• The WPI Athletic Hall of Fame inducted its charter members in 1983. Today, 14 of WPI's finest all-time athletes, coaches and friends of sport are members of the Hall.

• WPI "Weekenders," newest of alumni programs, are bringing together scores of alumni for fun, relaxation, fellowship—and a little education—at some of the East's most attractive meeting and resort locations.

What trends emerge from all these individual initiatives? Just this: WPI graduates of all ages are proud of both the tradition and the innovative education programs of WPI. Alumni participation—both financially and through voluntary action—attests to our commitment to the continuing good fortunes of the college. People make these programs work for people. In all, more than 2,000 alumni are giving of their time to help achieve these results.

For me, playing even a small part in all this has been a wonderful experience. As we look to the next two years and beyond, I know you will give my successor as president, Paul Bayliss '60, the same active support you have shown me.

Finally, I know you join me in thanking the men and women of the University Relations Department of WPI, under the leadership of Donald F. Berth '57, Vice President.

It is this group who provide the administrative support without which it would be impossible for the Alumni Association to achieve the phenomenal growth we enjoy today.

Harry W. Tenney

WPI Journal

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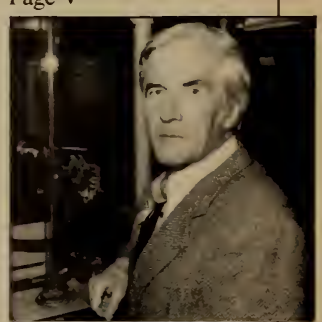
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Cover: In all its glory, springtime bursts forth at WPI. Photography by Michael Carroll.

Grading System Overhauled

Over the years, WPI's grading system has gone through several changes. Many alumni will remember the days when grades ranged from 0 to 100. Below 45 meant a failing grade—F—and 45-60 rated a "condition" (E), which could be raised to a 60 through a three-hour "condition make-up exam." The 90+ range was an A, 80s were Bs, 70s were Cs and 60s were Ds. Since no one, it was felt, was perfect, and 100 indicated perfection, grades of 100 were not given. A 60 was a gift pass, but 61 an earned D. What's more, grades between 55 and 60 were not given, and a 79 usually signaled an earned 80 but reservation by the professor that the student hadn't really performed at an 80 level. So much for that labyrinth.

Later, the numbers were dropped and the letters were retained in conventional A through F manner, with E still a "condition." Then the E was dropped along with its condition exam.

Still later, with institution of the WPI Plan, the letters were dropped, and only two passing grades retained: AC (acceptable) and AD (acceptable with distinction). This system contained no record of a failing grade, with the rare exception of an NAC (not acceptable), an indication of earned wretchedness in project work.

According to Dean of Undergraduate Studies William R. Grogan '46, the AC/AD system was an attempt to reduce "grade grubbing." "WPI's project system, with its prevalent component of student teamwork, requires cooperation and mutual support—elements that may be undermined by a conventional grading system," Grogan says.

The two-level passing system has worked reasonably well on campus, he contends, but is has been difficult at times to "translate" effectively to external groups such as parents, who may view it as a pass-fail system. Prospective employers, too, may find it hard to evaluate candidates at WPI without the presence of the B grade range.

Frank DeFalco '58

The Masked Marvel revealed. Roland Marquis is crowned New England champ at 126 lbs. for the second straight year.

Furthermore, with about 60 percent of all grades in one category—AC—many have felt that the system was not proving sufficiently discriminating. But at the same time, Grogan notes, the faculty has wanted to avoid a system that generates conventional quality-point averages (QPAs), because of the resulting tendency to overlook students as individuals, and the temptation to reinstitute class rank into the WPI experience.

Still, on March 7, 1985, and only after many months of debate among faculty, students and administrators alike, the faculty voted to change the grading system to A, B, C, NR (no record), without generation of official QPAs or class rank. Honors determination has been modified to include optional recognition of classroom work in addition to qualifying project and Competency Examination grades.

Students currently enrolled, Grogan points out, and those entering in 1985 will have a one-time opportunity to matriculate under the new system. The revised arrangement will apply to all students enrolling after May 1986.

Winter Sports Wrapup: WOW!

WPI enjoyed one of its best athletic seasons in history this past winter. The six Engineer varsity units achieved a smashing 71-30 (.701) cumulative record. Two of them, the wrestling and men's basketball teams, reached record single-season victories.

Head coach Ken Kaufman's cagers concluded the greatest basketball season in the school's 67 years of intercollegiate play with a 20–8 record, the first 20-win season in WPI history.

Among the wins were NCAA Tournament triumphs over Albany State (58–57, OT) and Clark (67–62) in Harrington Auditorium, allowing WPI to capture its first Northeast Regional title. Making its second NCAA Tournament appearance in the last four years, WPI had its drive to the Final Four dashed by Widener University in the quarterfinal round as the taller Pioneers (Widener's smallest starter was 6′4″) departed Harrington Auditorium with a hard-earned 41–38 victory.

During the course of the record-breaking season, many individuals were responsible for WPI's success, but none more than senior All-America guard Orville Bailey ('85, Springfield, MA). Bailey led the Engineers in scoring, assists and steals, and he finished as WPI's all-time single-season and leading scorer.

Along with Bailey, outstanding performances were turned in by guard Gregg Fiddes ('85, Webster, MA), center John Loonie ('87, Brockton, MA), and forward Paul Lubas ('87, Woodbridge, MA). Fiddes ended his career as WPI's third all-time scorer.

Meanwhile, head coach Phil Grebinar's wrestling club posted a sparkling 20–1 record and finished the dual meet season as the top-ranked team in New England Division III. The Engineers proudly carried their No. 1 ranking into tournament competition and walked away from Wesleyan University—site of the New England Col-

lege Conference Wrestling Association Tournament—with the tourney title. In the process, WPI established a Tournament record for most points scored with 165.75.

Seven Engineers reached the final round, and four were crowned New England Champions. Seniors Roland Marquis (Nashua, NH) won the 126-pound weight class for the second straight year, while Jeff Horowitz (Commack, NY) won at 142, Joe Crispo (Reading, MA) at 150, and Paul Wyman (Bridgewater, MA) at 158, each for the first time.

The four thus earned a trip to the NCAA Division III National Championships, where Wyman and Crispo distinguished themselves with a sixth- and seventh-place finish, respectively. Each earned All-America accolades.

While the basketball and wrestling teams enjoyed post-season success, the women's basketball team posted its fifth straight winning season with a 13–9 record. A late season slump, however, kept WPI from either NCAA or ECAC tournament action. Junior guard Kim Fay ('86, Nashua, NH) and Cindy Perkins '87, Fay's hometown teammate, sparked the Engineers' offensive attack throughout the season.

This year's men's swimming squad, as well, can rightfully claim a spot amongst WPI's winningest teams with a 9–4 tally, its best showing in five years. Head coach Whit Griffith's club was led, from the first meet to the last, by super-senior Bruce Carbone (Leominster, MA), the most prolific swimmer in WPI history. He qualified for the NCAA Division III Championships in the 200 and 400 individual medleys.

While Griffith's men attained new heights this year, his women swimmers made a respectable showing in their opening campaign as a separate team, ending with a 3–5 record. Cathy Dochak ('85, Albany, NY) spearheaded the effort, setting four individual records during the season. A young team, its talent promises continued growth.

Winning seasons are nothing new to track coach Merl Norcross. The 32-year mentor led his indoor team to a 6–3 record, including a second-place finish in the four-team Worcester City Meet.

Among the performers whose indoor efforts provided optimism for the spring season were hurdler Steve Montibello ('87, Haverhill, MA), shot putter Mike Skowron ('87, Pittsfield, MA), high jumper Tom Schibly ('88, Green Bay, WI), distance man Brian Laprise ('87, Weymouth, MA), half-miler Dan Laprade ('85, Holyoke, MA) and hurdler Greg Westgate ('86, Wareham, MA).

Highlighting the entire winter sports season was the February 2 Alumni Basketball Game, pitting the maroon shirts, with the likes of John Titus '80, Mike Stephens '57, and Chris Trainor '83, against the power of the white shirts, with all-time greats like Earl Bloom '54, Ken Johnson '73 and Jim Petropolos '83. In a matchup that went down to the final buzzer, the maroon shirts came out on top by a hair.

Gene Blaum
Sports Information Director

WPI Weekenders Are Off to a Bright Start

"The combination of pleasant surroundings, good company and serious, intellectual lectures is hard to beat!" These are C. Marshall Dann's ('35) impressions of the inaugural WPI "Weekender" program. He's not alone in his approval. Fellow attendee Earl Fairbanks, '51 found that the Weekender ". . . lived up to all my expectations!"

In all, 50 alumni, spouses and friends attended the March 8–10 affair, held at the Woods Hole Marine Biological Laboratories in Woods Hole, MA.

WPI Weekenders bring together alumni and their spouses from all walks of life for two relaxing days at attractive locations throughout the Northeast. The weekend is far more than fun and games, though there's time in the busy schedule for some of that, too. Here's a sampling:

For starters, this year's March weather at Woods Hole was six weeks ahead of itself. A Friday evening reception, followed by an authentic Cape Cod haddock dinner with all the fixings, set the tone for the entire weekend. Later in the evening, Management Professor Arthur Gerstenfeld brought the group up to date on recent developments on the Hill, including activities at the Washington, DC, Project Center.

Saturday morning breakfast preceded the "serious" element of the weekend, where Dr. Ronald Baird, along with researchers from the Woods Hole Oceanographic Institute, spoke on oceanic ecosystems, deep-sea fishes, the George's Bank fishing rights controversy and ocean floor geology and chemistry. Dr. Baird is a marine biologist and WPI Director of Corporate Relations.

That afternoon, the group took a break from their more intellectual pursuits for a leisurely tour of the Marine Biological Labs and Oceanographic Institute. Some rode the Martha's Vineyard ferry and sampled the sights and history of Edgartown before returning to the mainland for the evening program.

After dinner, Humanities Professor Malcolm Parkinson, a historian of European science and technology, made a stimulating presentation on medieval armor at Worcester's Higgins Armory Museum. It was a relaxing climax to a busy day.

To conclude the evening, the piano artistry of Ed Supple '47 provided the nudge for getting everyone to sing along to the popular hits of the last half century. Who says engineers can't carry a tune?

Before departing for home on Sunday, the Weekenders, by now a close-knit group, viewed "Washburn: The Tradition Restored," a multimedia show depicting the proud history and the promising future of the Washburn Shops, which was expanded and completely renovated in 1984.

Next stop for the Weekenders program is Historic Inns of Annapolis, MD, on May 10–12, 1985. "Technology and Medicine" will be the theme. Faculty experts from WPI, the Johns Hopkins University and the University of Massachusetts will cover a full range of topics on how technology is changing the practice of medicine. It's a field that affects us all.

And wait until you see Annapolis in May!

Athletic Fields Renovation Takes Shape

After 70 years of increasingly intensive use, WPI's athletic fields along Park Avenue will soon receive a major facelifting.

At the heart of the $1.9 million project will be the installation of all-weather synthetic surfaces on the present football field and the running track. The plan also calls for a reorientation of the baseball field, improved lighting for night practice and games, improved press box facilities, additional spectator seating, a new softball field and construction of two tennis courts.

"This is a badly needed but twice deferred project," Dr. Edmund T. Cranch said, in announcing the action of the Trustees.

"When Alumni Field was built in 1915, WPI had about 500 students, all of them men. These facilities have served us well for 70 years, but now we have 2,500 students, 20 percent of them women. Our fields are just not adequate for the

demands now placed on them by active—and successful—varsity, intramural and recreational athletics for men and women."

With installation of the synthetic surface, WPI will use the same space for football, soccer, lacrosse and field hockey play. The surface will permit practice on the same field, and, with the use of the new lighting, practice times can be scheduled to permit same-season sports to share the facilities.

Using the new surface, 1,500 participants in 13 varsity, club and intramural sports can be accommodated compared with the present 400 participants in five sports.

The new surface will also extend seasonal usage of the field. Inclement weather, poor drainage and soggy field conditions will no longer delay the start of Spring practice or force cancellation or relocation of field events. The present clay-cinder track has been plagued with drainage problems for years, and a synthetic surface and improved drainage will eliminate this problem.

According to Dr. Cranch, the need for renovation of athletic fields was recognized and preliminary plans made several years ago. This project was included in an earlier capital fund campaign conducted to renovate older campus facilities, but was twice deferred due to inflation and higher priority capital needs, such as a new residence center, which is now under construction.

Added Dr. Cranch, "To continue to attract well qualified students to WPI, it's vital that we offer not only top-flight facilities and programs, but that we offer them a total environment of quality. That environment certainly includes recreational resources."

As an indication of alumni support, the Class of 1934 last June committed its 50th Reunion class gift to these new athletic facilities in anticipation of the ultimate approval of the project by the Board.

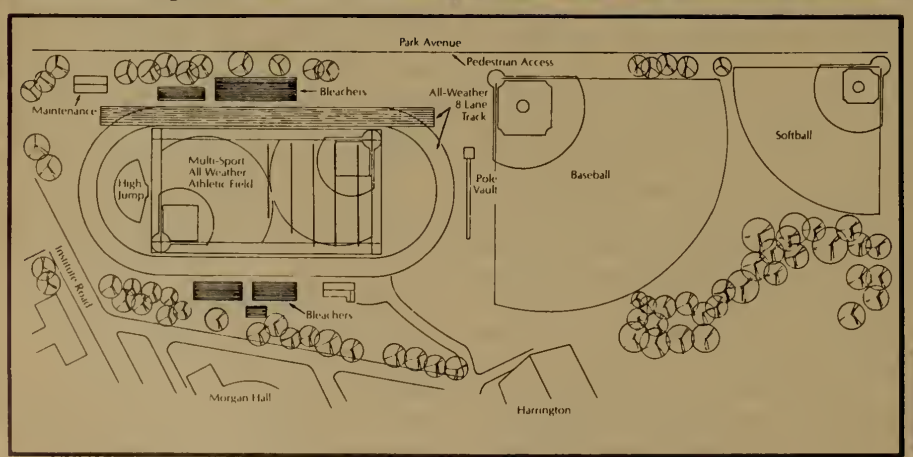
Director of Athletics and Physical Education James P. Culpepper, Jr. had this to say of the plan: "The improvements will make WPI a fine location for regional and even national track and field events. We'll be one of the few NCAA Division III schools with an 8-lane, all-weather track."

The renovation project will also include considerable regrading and the removal of an earthen berm between the present baseball and soccer fields to provide one continuous field surface. This area will be groomed and reseeded into a sound, grass surface facility. The baseball field will be rotated 90 degrees to the left to provide a level outfield with reasonable dimensions to both right and left field.

As part of the project, two additional tennis courts will be built near the four courts now located on A. J. Knight Field across Park Avenue. These will replace tennis courts which were formerly located on the site of the residence center now under construction. The new tennis court complex will provide tournament-level facilities.

Work is planned to begin immediately after conclusion of the spring athletic schedule in May, for completion in late summer.

Renovation of the athletic fields will commence in May. To most, the need is obvious.



1985–86 Tuition Announced

WPI tuition will be $8,900 for the 1985–86 academic year. The announcement of the $900 increase over current tuition was made February 26, following a meeting of the WPI Board of Trustees. The total estimated cost for a typical resident student, including tuition, room and board, and fees, will be approximately $12,400.

In his letter to parents announcing the increase, Dr. Edmund T. Cranch noted that a top quality program in undergraduate engineering and science remains one of the most expensive academic programs taught today on any campus.

"Modifying physical plants to accommodate new technologies as well as providing increased student access to computers is becoming increasingly more expensive," wrote Dr. Cranch.

"While an engineering education is among the most costly to provide," he added, "it is also true that, for the graduating senior, a degree in engineering or science is one of the most attractive in terms of career opportunities and starting salary.

"WPI is one of 16 independent colleges of engineering and science in the country which share many of the same academic characteristics and laboratory needs," he said. "As we view those institutions' student costs for the coming year, we find that WPI appears at just about the middle of the range."

Today, 80 percent of WPI students are receiving financial aid in some form. WPI will continue to do everything possible, Dr. Cranch wrote, to see that all students enjoy the opportunity to complete their academic programs in spite of increasing costs.

WPInteractions Expanding

Conferences, scholarly symposia, professional meetings—these are the kinds of events that help build strong alliances for WPI with industry and other colleges and

A JAZZY MOTIF: *Jazz guitarists Ralph Towner (left) and John Abercrombie were just two of the musicians to join forces at WPI for the first Jazz Worcester festival, February 4–10, 1985. Among other performers with national reputations to appear at WPI and in other locations across Worcester were virtuoso vibraphonist Gary Burton, trombonist Phil Wilson and woodwindist Jimmy Giuffre. What started as a jazz clinic at WPI, under the direction of Richard G. Falco, a visiting instructor in music, turned into a major cultural event for the city. Falco marshaled a wide variety of community resources for the festival, starting with WPI and the Worcester Cultural Commission, both of which provided seed money for the event. Works by Professor of Music David P. McKay and the WPI Jazz Band shared the week-long spotlight with more than a score of other national and local performers.*

universities. They also expose outside experts to WPI faculty and student research and educational programs, a must in the arena of science and technology.

Each year, dozens of such events large and small bring hundreds of people to campus. Recently, two symposia, on widely diverse subjects served to highlight the mid-winter season. Here are accounts of these meetings.

NURTURING ENGINEERING INNOVATION: More than a symposium, it was a call to action. Industrial companies, if they are to thrive—or even survive—must learn to embrace innovation.

At a half-day conference co-sponsored by WPI's Manufacturing Engineering Applications Center (MEAC), some 90 students, faculty, researchers, managers and executives heard a panel of experts consider engineering innovation from every angle.

Charles A. McKay of The Foxboro Company noted the need to educate rather than simply train engineers. He used the WPI Plan as an example of innovative education. Arguing against two common misconceptions, he said that businesses *can* schedule innovation, and standards *don't* necessarily stifle innovation. NASA, he said, was an example of the first, and the IBM personal computer an example of the second.

MEAC Director David P. Asmus offered a completely automated West German automobile plant as a model of the new industry-university-government partnerships which will be so vital in the coming years.

Francis C. Kelcourse, Director of Digital Facilities and Services Lab at the new AT&T Bell Laboratories in Haverhill, MA, stressed the need for an environment that fosters innovative research. He touched on everything from office layout to telecommunications to the need for quiet and privacy.

"Lead engineers," he said, "must have the ability to think beyond the task at hand. Leadership ought to exist at the team level, not just at the top."

Bernard N. Slade of Arthur D. Little, Inc., reminded the group of the need for innovation in manufacturing as well as in research. "Manufacturability is the key," he said. "Designs are worth little if they can't be profitably put into production."

Some people are more receptive to innovation than others, noted psychologist Leo F. McManus, president of L.F. McManus Company, Inc., a national firm that specializes in behavioral science programs for management development. Management must learn to recognize varying personality styles: some workers need freedom and challenge, others need guidelines. In all cases, innovation results from an emphasis on people rather than on things such as growth, earnings or technical capability.

Norton Company representatives included moderator Dr. George S. Reichenback, Vice President for Bonded Abrasives, and Dr. Terry L. Loucks, Vice President for Corporate Technology. "It's Norton's enthusiasm for learning that will take it on another 100-year cycle," suggested Dr. Loucks.

TECHNOLOGY AND THE WRITER: The engineer as hero was considered at the second of this year's three special humanities lectures at WPI.

Cecilia Tichi, Professor of English at Boston University, traced the impact of engineers on modern American fiction. Popular potboilers of the early 20th century, which depicted engineers as romantic figures—heros who brought modern civilization to the inhabitants of jungles and barren deserts—may not have endured as important works of fiction, she said, but they did influence such later writers as Willa Cather, John Dos Passos and, especially, William Carlos Williams.

It was the engineer's value of efficiency, Tichi said, that influenced Williams to ultimately see a poem as "a machine made of words."

MORE: In addition, as the *Journal* went to press, the following conferences were about to convene: **the Eleventh Northeast Bioengineering Conference;** March 14–15, 1985; and **the New England Biotechnology Association Colloquium II;** March 21–27, 1985.

Correction

In the February 1985 issue of the *Journal*, we failed to recognize the $110,000 Reunion gift of the Class of 1933, which was applied to the renovation of the Washburn Shops. This generosity helped make possible construction of a class/seminar room in the "new" Washburn. WPI thanks the Class of 1933 for this outstanding gift. The *Journal* regrets the editorial omission.

Living in the Materials World

Materials engineers—including those at WPI—live with failure every day of their lives.

By Michael Shanley

Materials engineers are fascinated with why things crack, splinter, corrode, explode or just plain wear out.

They also wonder about things like how many shaves are in a razor, how acid rain destroys a statue, or how diesel engines could be made more efficient.

The handiwork of materials science and engineering—the study of everything from plastics to steel to high performance ceramics—is everywhere.

"The ball point pen you're writing with—" says WPI Materials Division Head Ronald R. Biederman to a visitor, "a lot of science has gone into that from tip to stem. Why is the barrel made out of plastic instead of metal? And why is the tip made out of metal and not plastic?"

Biederman beams. He loves talking about materials. His office is located where the action is—in the middle of the materials lab area on the second floor of the new Washburn Shops' north wing. Since his door is seldom closed, there's a constant procession of students and colleagues stopping in to ask a question or proclaim an accomplishment. Biederman—amazingly—seems to know exactly what each is working on.

While his own primary research is in metallurgy and microstructural analysis, his interests extend to virtually all areas of materials science.

"Our main objective," he explains, "is to understand structure, and then relate structure to properties. In other words, if I know how something is put together, I'll know how it behaves. And vice versa. That's the premise of everything we do."

Getting back to the pen, he explains, "The stem is plastic because plastic is inexpensive and light. But plastic won't work as well for the tip because there's a tremendous amount of pressure exerted on a very small point. Materials engineers have studied it from every angle."

Today's materials engineering is firmly rooted in the intense competitive drive to make things stronger, lighter, faster, cheaper—to build a better mousetrap. (And, preferably, build it before anyone else does.)

In the end, the questions that need answering usually involve failure. How much wear and tear will a particular material withstand? Where will it break? How long until it wears out?

"We're interested in the upper limits of failure," says Biederman, "and how crucial that failure is. If the tip of your pen breaks, that's one thing. But if the wheel falls off your automobile while you're driving down the highway, that's quite another.

"The nice thing about metal," he adds with something like affection, "is that it usually bends before it breaks. It warns you."

Michael Carroll

Like other branches of science and engineering, the study of materials has evolved with the times, responding to the demands of society. For centuries, people have been scorching and freezing things, examining breaks, studying wear and tear—even trying to turn metal into gold.

These electron microscopes—one a transmission, the other a scanning type—receive heavy use by graduate and undergraduate students.

It's just that now we have electron microscopes that can magnify an object to two million times its normal size; sophisticated testing machines that can precisely heat, bend or crack a specimen; and computers that can make split-second calculations. Where once there were wood, metal and stone, there are now superalloys, high performance ceramics and exotic polymers.

In addition to all the high-tech wonders, however, materials engineering bears the stamp of another uniquely 20th-century phenomenon: the lawsuit.

"We've become a very litigious society," notes Biederman. "And engineers have to be sensitive to that. No longer can you plead ignorance when something goes wrong. You've got to be up on the latest technology. You've got to be sharp."

Nobody knows that better than Professor Roy F. Bourgault '42, who retires this year after 30 years of teaching at WPI. As a sideline, he has for many years served as a technical expert on failure analysis. Manufacturers, insurance companies and lawyers ask him to examine cars, trucks, hammers, ladders, drills, cranes, chains. He testifies for either plaintiffs or defendants—it doesn't matter. Nor does he claim to always arrive at that elusive entity called "truth."

"I just present my findings," he says. "A lot of the time I never even find out what the verdict was." And a lot of the time what's "right" is not so easy to determine, as in the case of a hammer that chips and injures someone's eye.

"First of all," says Bourgault, "you can't manufacture a hammer that won't chip. Second, the chip always flys backward toward the center of rotation—which means people get hit in the face. In the old

days the issue was the manufacturer's failure to warn. Now they all include a warning, so when someone does get hurt, whose fault is it?"

That's the kind of question Bourgault wants his students to grapple with, so he uses past cases as classroom examples. Technical engineering problems are thus realistically intertwined with safety, design and even moral issues.

Take the question of the truck driver who was fired for falling asleep at the wheel. His tractor trailer smashed through a guardrail on the Massachusetts Turnpike and came to rest at the foot of an embankment. The driver wasn't seriously injured, but the company fired him because they assumed he had dozed off.

The driver, however, claimed he had pulled into the left lane to pass a car, and then lost his steering. After a detailed examination, Bourgault found that a tiny crack in the steering assembly had, through repeated use, grown bit by bit until a crucial piece snapped. The driver was right: his steering wheel was absolutely useless at the time of the accident. What Bourgault doesn't know for sure is whether the driver got his job back.

Professor Ron Biederman: "These days you can't exist as a modern technological university without support from industry. Colleges can't do it by themselves, and government funding goes largely to major research centers."

We know that acid rain is severely damaging some lakes, streams and forests of the Northeast. But other effects have yet to be uncovered. The Blackstone Valley Electric Company of Rhode Island, for example, was concerned that acid rain might be causing the connectors and conductors on their high-tension power lines to corrode—a development that could have serious long-term effects.

Professor Richard D. Sisson, Jr. of the materials group, along with Professor Alexander E. Emanuel of the Electrical Engineering Department, is examining that possibility.

"Besides doing standard lab tests, we built a rain chamber and exposed the connectors to 'years' worth of rain," Sisson says. Preliminary findings suggest that the rain is not seriously damaging the electrical parts.

Over the years, Sisson has done a lot of research on corrosion, which is simply a return of metal to its natural state. Since most metals are mined as ores and then refined, corrosion represents a reversal of the refining process. The chemical reaction that takes place involves removal of metallic electrons and the formation of a more stable compound—like iron oxide, or rust.

One of Sisson's student project groups is studying the effect of acid rain on copper statues. "Normal rain is somewhat acidic due to carbonic acid formation," explains Sisson. "And it reacts with the copper to actually help protect the statue. But the rain is now becoming a mixture of nitric and sulfuric acid, and that's corroding the copper."

With Biederman, Sisson has done work for the Warner-Lambert Company, which owns Schick, Inc., the razor blade company. They studied the effectiveness of thin film coatings on razor blades.

Sisson is also interested in thermal barrier coatings—a thin ceramic layer that helps protect metal against high temperatures. A diesel engine, for example, loses roughly one-third of its energy to the exhaust system and one-third to the radiator, leaving only the final third for power. By coating metal with ceramics—which have a much higher melting point and lower thermal conductivity—as much as half of that lost power could be regained.

Sisson predicts such a ceramic-coated diesel engine is "not too far down the road." The problems that need to be

Michael Carroll

worked on are the low fracture toughness of ceramics and the difficulty of achieving a proper bond.

For the General Electric Company, Sisson is studying special coatings that allow turbine blades to withstand extreme heat. Specifically, he is microstructurally tracking the progress of GE's secret ingredient, which Sisson calls "fufu dust."

"It's a combination of four or five alloys," says Sisson. While he can't reveal exactly what's in the "dust," he does say that it's not all that earth shattering; most major companies in the field have their own "secret formula."

Sisson also does ceramic coating work in conjunction with NASA and the Norton Company. Norton's high performance ceramics division, located in Worcester, has a longstanding relationship with the WPI materials group. Over the years, a common interest in the evaluation of ceramics has led Norton to donate both materials and equipment to WPI.

"Some of these sophisticated ceramic coating systems are so expensive that just getting them from Norton or NASA to evaluate is a major benefit," Sisson says.

A recent Norton grant allowed WPI to buy an ion milling machine, which removes atoms from a material by bombarding it with ions. The process, used on ceramics, thins the material to the point where it can be examined under a microscope.

Students advised by Sisson are working on everything from the acid rain-statue study to coatings for biomedical devices.

"One of our graduate students, Ichiro Sone, developed an X-ray diffraction technique to analyze thermal barrier coatings," Sisson says.

Two other graduate students are studying at WPI as part of Digital Equipment Company's graduate engineering education program. They're working on coatings for microelectronic devices, and on ceramic substrates—what the microchip connections are made on.

Microelectronics represent an important new part of materials engineering. Often, the underlying question with integrated circuits and other sophisticated devices is, how do you get the heat out? That's where processes like ceramic coating come in.

These "micromechanics" problems are something that Assistant Professor Isa Bar-On is interested in.

"Semiconductors have to be connected," says Bar-On, "and that connection is often critical. During its lifetime, these parts see a lot of stress and heat cycling, which leads to mechanical failure."

Since microelectronic parts are made of silicon, metal and other materials, considerations such as how to deal with a crack that begins in a ceramic layer and then moves to a metal layer are crucial.

Questions like these are in line with Bar-On's primary interest—fracture mechanics. Associate Professor Floyd R. Tuler, also a fracture mechanics expert, notes that the discipline has come a long way. "Fracture mechanics used to mean looking out the window of an airplane midway through a flight to check for cracks," he says with a grin. Advanced research began after World War II.

Tuler and Bar-On now conduct their experiments on a sophisticated materials testing system in the Arthur E. Smith ('33) Laboratory. A computer makes split-

The computer-controlled materials testing machine in the Arthur E. Smith Laboratory lets Floyd R. Tuler (left), Isa Bar-On (right) and Colin Lawrence '85, of Winsted, CT, precisely evaluate specimens.

Michael Carroll

"A third of the world's energy resources are lost due to friction and wear," says tribologist Sara A. Dillich.

second calculations and allows precise measurements to be made.

A material can be tested in a variety of ways. Compression and tension tests—in which a sample is either "squashed" or "stretched"—indicate how much load can be withstood. Some materials become stronger when stretched to a certain point, but may also become more brittle.

Impact tests measure capacity to withstand a "shock load," such as might occur in sudden, isolated instances. In fatigue testing, a lifetime cycle of "abuse" is simulated by cyclic loading. A sample may be bent or twisted thousands of times per minute. It may also be tested to determine its behavior under extreme heat.

Since materials, like humans, all have cracks and flaws—be they microscopic or clearly visible—the vital issue is determining when the combination of crack and stress will reach the critical point.

That's an important question for a company like the Electric Boat Division (EB) of General Dynamics Corp. EB, which builds submarines, can conduct precise analytical tests—computer modeling and so forth—but prefers to back them up with laboratory experiments, currently being carried out at WPI.

There are a number of variables EB must consider. A submarine's hull, for example, is alternately pressurized and depressurized. Weld joints change the properties of the steel. Sea water, too, so intensively corrosive, is another consideration: As soon as an object cracks, it corrodes much more rapidly. EB sends Tuler and Bar-On samples, and they run them through a battery of tests.

For General Electric, Tuler is studying materials used to make jet engine parts formed under optimum conditions of temperature and rate.

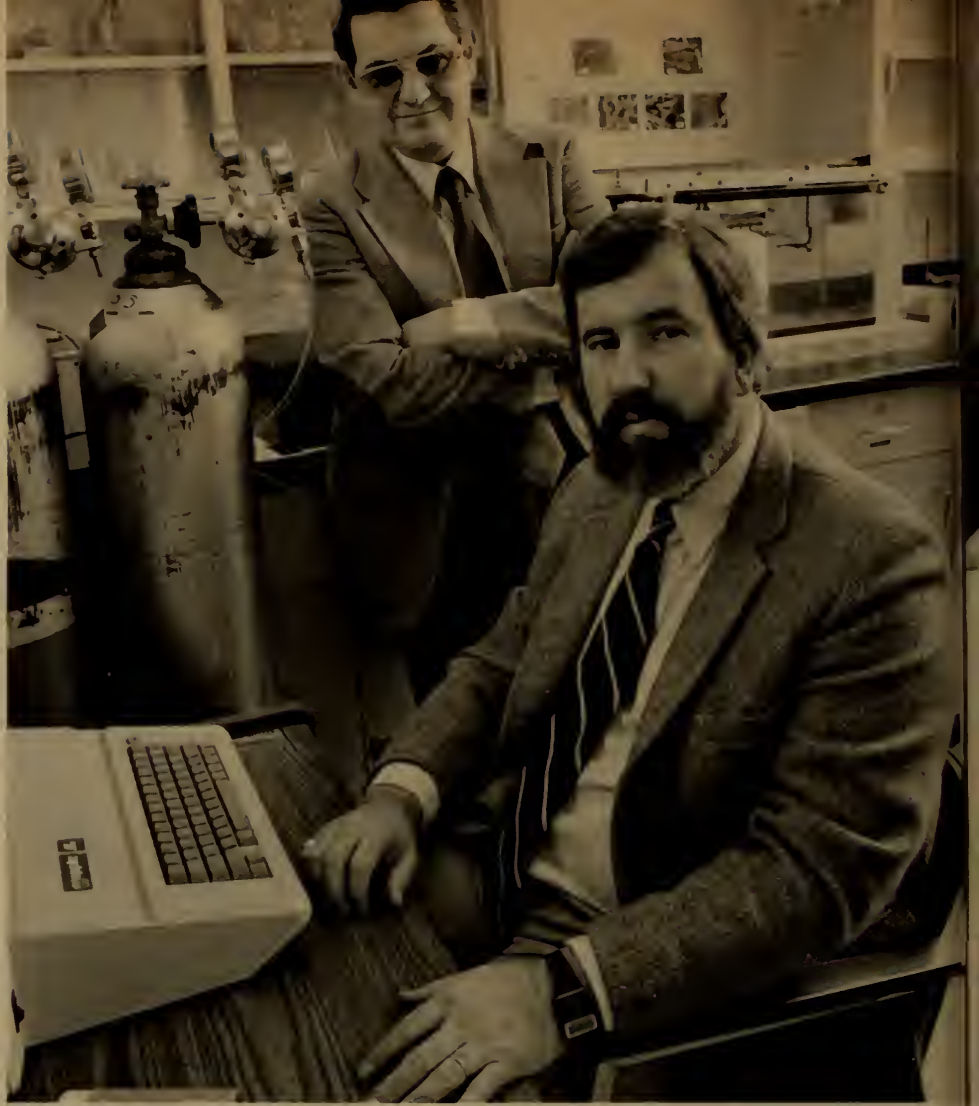
Similarly, he conducts fracture evaluation on superalloys that the Wyman-Gordon Company uses to forge jet engine parts for the Air Force.

A group of Tuler's project students are evaluating a new composite material developed by Science Applications International, Inc., of La Jolla, CA. The material—silicon carbide reinforced aluminum—has the advantage of being both stiff and light. The project group is examining fatigue crack behavior.

It's not cracks so much as wear and tear that interests the newest member of the materials group, Assistant Professor Sara Dillich.

"A third of the world's energy resources are lost due to friction and wear," says Dillich. "Not to mention billions of dollars in down-time."

One of the techniques that Dillich and other tribologists—those who study friction and wear—are exploring is the use of ion implantation to change a material's



Richard D. Sisson, Jr., (foreground) and Alexander Emanuel (Electrical Engineering) are studying the effects of acid rain on the connectors and conductors on high-tension power lines.

surface properties. Although the ions penetrate to only a very shallow depth (100 to 200 nanometers, one nanometer equalling one billionth of a meter), significant changes in a material's mechanical and chemical properties can be effected.

"The important advantage about ion implantation is that it doesn't produce dimensional changes in the workpiece," says Dillich. Current industrial uses for the procedure therefore tend toward parts with tight tolerances—ball bearings, gears, valves and pumps and high speed drills, for example.

While just about any element can be implanted, Dillich says, nitrogen and titamium implantations have been most successful in improving the tribology of steels. Dillich is also interested in surface modification by laser processing, and cavitation erosion—the wearing away of sur-

Michael Carroll

Longtime engineering assistant George E. Schmidt, Jr., an expert photographer, oversees the extensive darkroom facilities. Besides instructing students on the finer points of developing film from the electron microscopes, he produces graphs, charts and prints for faculty research projects.

faces like metal or concrete due to the collapse of air pockets in a surrounding fluid.

If understanding the structure and properties of a material represents a vital starting point, the logical next step is placing the material in a useful form.

"Once you know what your goals are," says Professor Bennett E. Gordon Jr., who oversees the materials processing facilities on the first floor of Washburn, "then you have to select the right material and the right manufacturing method."

Thus the first floor of Washburn is equipped with a full range of machining, welding, casting and heat treating facilities. In addition, there are facilities for injection molding, computer numerical control (CNC) machinery and computer-aided manufacturing (CAM). Right next door are the robotics labs of the Manufacturing Engineering Applications Center (MEAC), where programmable automation can be introduced into the manufacturing process.

This combination of the fundamental and the high-tech approach to engineering is especially appropriate for undergraduate students.

"No matter how many computers you have," Gordon points out, "there are some machining processes that are fundamental. You've got to understand the basics of making and shaping."

Certainly the people at Worcester's Wyman-Gordon Company would agree. As one of the largest producers of advanced forgings for aerospace products, they are constantly looking for ways to make better forgings more efficiently.

While a good deal of their research is done on the manufacturing end, it starts (or ends, depending on how you look at it) under a microscope. More specifically, it starts with Ron Biederman peering into one of the giant electron microscopes across the hall from his office. One was donated by the Elizabeth A. Lufkin Trust and one by Wyman-Gordon.

"The company came to us in 1975," Biederman says of Wyman-Gordon, "looking for a place to help them conduct more fundamental research, primarily on nickel- and titanium-based alloys. They were willing to donate funding and equipment if we were willing to explore issues of concern to them."

At the time, Biederman had more work than he could handle, but he knew this was too good an opportunity to pass up. What Biederman calls a "win-win" agreement was reached, and the relationship has been going strong ever since.

"There are a number of ways to make forgings," Biederman says, by way of explaining Wyman-Gordon's primary emphasis. "And the best way differs with each material. You also have to juggle forging variables—like temperature and strain rate. The strain rate, for example, can be different in different regions of a forging. Uneven strain leads to uneven structure which leads to uneven properties."

To get an idea of the delicate nature of some of Wyman-Gordon's work, consider the turbine engine components produced through a procedure called powder metallurgy processing. The metallic powder is compacted in a die, then heated and fused. Not only is the powder extremely expensive—as much as $50 a pound—but the danger of contamination is ever present. While the company takes extreme precautions to prevent oxidation—the powder is never exposed to the air from the time it is produced until the time it is fully consolidated—the material still needs to be checked.

Usually, a "plug" is taken from an appropriate part of the finished product, and careful microstructural analysis is performed. Biederman does this using the analytical electron microscope donated by Wyman-Gordon. Analytical microscopes have the capacity to perform as a scanning or a transmission microscope. With a scanning microscope, the electron beam sweeps across a specimen, and an image is formed in much the same way that a television picture is produced. A transmission electron microscope is similar to a regular optical microscope, except that the object is "illuminated" by an electron beam rather than light.

"A school doesn't just go out and buy one of these," Biederman says, nodding toward the electron microscope. "And even if you could afford the initial investment, the maintenance is unbelieveable. And assuming you could handle *that*, you couldn't afford to replace it after it became dated. After making that kind of investment, you'd have to hang onto it for years and years.

"It's the same thing with MEAC. Colleges by themselves can't set up a lab and continually stock it with state-of-the-art robots.

"These days you can't exist as a modern technological institution without support from industry. Colleges can't do it alone and government funding goes largely to major research centers."

This place is busy," Biederman is saying now with a grin. Students dart in and out of the shiny new labs that line the corridor. They peer through microscopes, polish samples, develop film or chat with faculty members.

"But I wouldn't have it any other way," he continues. "You either have an open lab or a closed lab. There's no inbetween. Here, everybody can use just about everything. That's the way we do things."

Which seems to be just fine with everyone involved. This corner of the campus is alive with a vibrant faculty and top-notch facilities—proving once again that some people are a complete success at dealing with failure.

Michael Shanley is director of the WPI News Bureau.

First of a two-part series.

Student projects—one in the major field (the Major Qualifying Project, or MQP) and one that brings technological know-how to a societal need (the Interactive Qualifying Project, IQP) are the uniting element of the WPI experience. Projects are as diverse in their focus as students are in their personal goals.

Projects confront students with the kinds of technical demands, budgetary and time constraints, teamwork interchanges and accountability that they'll find once they enter the world beyond Boynton Hill.

The exercise is uncommonly life-like. In fact, in their projects students often serve as consultants or researchers for corporate, nonprofit or government organizations, on campus and off, working alongside faculty and practitioners, acting as junior colleagues where the stakes are real.

Daniel Laprade compiled the following accounts of a broad selection of student projects. They were published earlier this year in *Newspeak*, the WPI student newspaper. Dan, who will graduate this year in civil engineering, is from Holyoke, MA.

PROJECT UPDATE

By Daniel Laprade '85

Computer Science Project Blazing New Trails in Physiology

There may not be obvious connections between a couple of WPI computer science majors and the medical personnel at the University of Massachusetts Medical Center. But for Computer Science Assistant Professor James Coggins and MQP students Beth Phalen ('85, Towaco, NJ) and Sue Abramson ('85, Wilmington, DE), their CS background has plunged them into an exciting new realm of physiology.

The project was sparked by Coggins, who has done work at the UMass Medical Center, located in Worcester. He was aware of research being done by Dr. Fred Fay, who has been investigating smooth muscle cell construction. But according to Coggins, Fay ran into complications when it came time to develop a mathematical computer model of these cells.

Adds Abramson, "Dr. Fay had been trying to visualize in three dimensions just what smooth muscle cells look like." In particular, she says, the orientation of the cells' protein bodies, which are believed to affect their contraction, was a problem.

Research in this area is commonly done using microscopic photography. Such methods, however, still leave the researcher with a two-dimensional expression of what is, in reality, a three-dimensional system.

"The problem is similar to computer-aided design and manufacturing [CAD-CAM] systems," explains Phalen. "For years people worked with design blueprints, which did not always do an adequate job of representing the third dimension. Then the CAD system came along, and you could turn the picture around on the screen, you could lift it up, flip it . . . it made 'seeing' an object so much easier. This technology seems to enable new ways of looking at cells, too."

"We want to put muscle cells on the computer screen and be able to 'travel' through them, and turn and look at them from whatever angle we want," says Abramson.

Information from the photographs of the different orientations of the protein bodies is used to develop a data base and thus to create the cell image on a graphics screen. The graphics screen is similar to a regular computer terminal, but offers more than 4,000 shades of colors to aid in "seeing" the cells.

The specific area that Phalen and Abramson are concentrating on is allowing the computer user to be "mobile" within the cell. By moving a joystick (similar to those used for video games) the user can move through the cell.

"As Professor Coggins likes to describe it," says Abramson, "it allows you to become microscopic and fly through the cell and stop and look up or down, right or left, or whatever." Being able to 'fly' through the cell allows Dr. Fay and his colleagues to determine the arrangement of the protein bodies. Further, the bodies that are strung together can be shaded in a color to allow for clearer visualization.

Every Wednesday the project partners and advisor Coggins head for the Medical Center to use the graphics system. The women admit that at first the whole scheme seemed a bit much. Phalen recalls the fall semester anxieties: "When Sue and I first got into this work not only were we a little apprehensive about the physiology background we might be expected to know, but also neither one of us had done much work with computer graphics."

The team spent a good part of the fall familiarizing themselves with the graphics system at the Medical Center. With the help of enthusiastic support of both Coggins and the Medical Center staff, the two women have forged ahead into a project that clearly excites them.

"This is really quite a pioneering adventure," Abramson points out. "It's the first time that the physiology field at UMass has used computer graphics to aid in their research." Eventually the women hope to write a manual that can simplify use of the system to enable more and more medical personnel—who may not be computer experts—to benefit from this new technology.

Abramson and Phalen emphasize that their work is just the beginning. Already, they have found new avenues of investigation wide open for further work, if only they had the time to pursue them.

MEs Tackle MQP That's a Test of Strength

For Senior Mechanical Engineering students Scott Hand, Teresita Icaza, Jean-

Paul Thomsin, and Frank Wu, the testing room in the hollows of Higgins Labs has become more than a familiar place. It's here that they have spent endless hours using the 400,000 lb. tensile machine as part of an MQP sponsored by the Riley Stoker Company of Worcester.

It was nearly a year ago that Riley Stoker sent a letter to WPI offering project work testing a structural support system that it felt to be overdesigned and thus too expensive. The challenge caught the attention of the four students and mechanical engineering Professor Raymond R. Hagglund. By the beginning of Spring Term 1984, the group's work was already underway—work that at times would pose intriguing complications.

The Riley Stoker challenge developed out of the design of steam generating furnaces. On a large industrial scale, the boilers of these systems are seldom allowed to be attached to the floor or wall structures because of the expansion resulting from the tremendous heat generated. More frequently, such systems are hung from ceiling beams.

The vertical support structures for this system are attached to the boiler's large super-heated steam collection pipes, called headers. It is the attachment of these support units, called lugs, to the headers that has become an area of concern. The current practice, says Thomsin (Acton, MA), is to weld the lugs to the header, a process that takes about two hours for each header/lug assembly.

There is no wealth of data for such an attachment design. However, work done in the 1950s by P.P. Biglaard, who conducted both theoretical and experimental work in this area, has given the group insight into the analysis of header/lug attachments. Unfortunately, the Biglaard theory does not extend to the strain ranges used in the Riley Stoker system. As Wu, who is from Lexington, MA, explains, "The existing curves on weld design do not cover the zone we are dealing with, so we have to try to get the feel for what those extended curves might look like."

After the group had familiarized themselves with the background literature, their next task was to design the test model to be used in the tensile machine. Since it was impractical to use the actual furnace header, they had to develop a highly representative model of the system. They came up with two slightly different models to simulate the two header/lug assemblies most frequently encountered. The manufacturing and shipment of the models was a project in itself, Wu adds.

Lisa Alpers '88

MQP team members (front to back) Scott Hand, Jean-Paul Thomsin and Terry Icaza testing the design integrity of a Riley Stoker Corporation header/assembler.

Thomsin describes the situation: "We sent our specifications to Riley Stoker, here in Worcester, and they sent them to their manufacturing plant in Erie, PA. From there the two models were sent to campus. Each of the models cost about $4,000 without labor, and we soon found out they weren't light—about a ton apiece."

Once the models finally settled into the basement of the ME building, the team set up for testing. The surface of the model had to undergo extensive preparation treatment before the team could locate some 80 strain gauges used to collect the data needed for further analysis. Each gauge has two connecting wires, so once the model was completely hooked up, the team viewed a mammoth hunk of material shrouded in wires.

As a result of their research, the team feels that the attachment in question is unquestionably overdesigned. In their models they anticipated using tensile loads around 140,000 lbs., but have discovered

that they may have to go as high as 250,000 lbs. to cause failure. They are concerned, however, that other parts will fail at such high loads, and they are also unsure whether the actual system is true to the model design the team sent to Riley Stoker.

"We are finding that there are slight variations in some of the specs we sent in, and what Riley Stoker sent us," says Hand, of Plymouth, MI. "If something is off by even a hair, it could generate questionable data. Right now we don't know for sure how this will affect our results, but we're hoping that such small variations won't hurt."

Despite complications, the team is quick to acknowledge the fact that Riley Stoker has been supportive throughout the MQP efforts. The aim, of course—for both Riley Stoker and the project team—is to save the company money.

EEs Challenge Conversion Scheme

While many student projects are leaps into innovative design, others are sparked by curiousity about scientific theory. Such is the case in an MQP developed by three electrical engineering majors, Andrew Cott ('85, Nashua, NH), Reynold Dodson ('85, Gales Ferry, CT), and Dave Grusell ('85, Worcester, MA), with the help of Assitant Professor David Cyganski '75.

This project has been in the making for some time—at least in the mind of Professor Cyganski. The group explains that he knew of a new scheme developed for converting analog signal to digital and vice versa. Cyganski, however, was not sold on the design, since he had worked on similar systems while employed at Bell Laboratories.

Cyganski introduced the trio to the research report "Proceedings of 1981 European Conference on Circuit and Design," and the group enthusiastically accepted the challenge of proving or disproving the system scheme.

Converting analog to digital and vice versa has become commonplace in electronics. And the concept behind switching and sending digital and analog information is not as complex as one might think. Analog information can best be represented by transmitting waves through the air, similar to the method used in radio or television broadcasts. This technique allows for great detail in information, but is subject to interference.

Digital schemes, on the other hand, are immune to the problems of interference because information is transmitted binarily through a wire, as occurs in a computer. Unfortunately, digital systems are short on detail. So in an effort to incorporate the best features of both, researchers have developed a method of converting analog to digital and digital to analog. This procedure is utilized in myriad technologies, such as telephone systems and digitally-recorded music.

Since the systems exist—and work—the brunt of research has been to create the most efficient system of conversion—thus to reduce costs. The MQP group is curious about the results in the mentioned report.

As Dodson explains, "We know that the system described works, but none of us believes that it works up to the performance specifications listed."

The initial task for the group was to build the system according to the details laid out in the report. Next they would carry out the same testing procedure as those described and compare the results.

This work requires close attention to the details of the report to ensure accurate data. "This had been a bit of a problem to us," explains Grusell, "because the report explains what has to be done, but doesn't give much detail as to how to do it."

Adds Cott, "We're not the only people who have felt their report is shoddy. At an IEEE [Institute of Electrical and Electronic Engineers] conference that Professor Cyganski attended, there were others who questioned the entire study."

Although they have been hampered somewhat by the lack of detail, the group report that the work is progressing well, and they do not anticipate any major complications. They feel confident that they can duplicate the system and get valuable data.

The investigation continues.

Debugging Industrial Management at GE

With industrial competition so fierce, pressure on industrial engineers to boost efficiency ratings is a given in the corporate millieu. Some companies find help from consulting firms. Others seek assistance through WPI's undergraduate project system.

General Electric Company is hoping that the MQP team of Jeff Horowitz ('85, Commack, NY), Amaro Goncalves ('85, Venezuela), Franz Roesner ('85, Avon, CT), and Mary McLaughlin ('86, Hanover, MA) can improve the efficiency of the firm's Aerospace Division plant in Wilmington, MA.

According to Roesner, GE considers operating costs too high and the time lag between manufacturing and sales too long. The company, he notes, seeks an advanced automation system design from the group and their advisors, Management Professors Arthur Gerstenfeld and Hans Thamhain.

After several weeks of stop-and-go starts on the project, needed to establish priorities with company officials, the plan that the project team selected was similar to one GE uses for its defense plants. It is a method that involves six steps: top-down factory analysis, comparative study with current automation plans, systems specifications study, vendor-selection study, final recommendations, and implementation.

This type of approach, says McLaughlin, involves a tremendous amount of work. The team explains that they have the time to tackle the first three phases, but the analysis will not be completed until several more project groups have completed the work they have started.

In some of their preliminary studies the team has identified several problem areas at the Wilmington plant. One weak area appears to be stockroom techniques. Explains Horowitz: "GE receives a shipment of materials in, say, the morning, but it might not get recorded in the computer system until the end of the day or even the next day. Well, in the meantime, some of those materials have been taken out of the stockroom, and the final result can be an inaccurate inventory. We're recommending improvement in the automated stockroom for a start."

Another area of concern is product flow. The group will suggest approaches to rerouting materials more efficiently. The team also cites an inexpensive recommendation to create "group technology work stations." These arrangements combine similar work operations into the same physical area, which cuts down on wasted time, says Goncalves.

All of these recommendations are relatively broad, he admits, since most of the group's efforts thus far have been to establish a plan of approach. "We've conducted a systems analysis," he adds, "but we hope that later project groups will do more detailed evaluations."

Working in the same direction as the WPI project group is GE's own consulting firm. "We anticipate that the final reports of both groups will be taken into consideration when proposed changes reach the decision stage," says Horowitz.

Graduate student Gerald Kulhowvick (left) and Edward Williams '85 prepare a portion of an offshore oil rig support beam, with its scallop-shaped repair sleeve, for finite element analysis.

Adds McLaughlin, "GE seems to be taking our work seriously. So are we." On several occasions, she says, "The company's enthusiasm was such that we had to remind them—politely—that the project team consists of students, not professional consultants. But that's OK with us."

Researching Offshore Oil Rig Repairs

Although offshore oil rigs are far from WPI, a fascinating element of these marvels of construction has sparked a challenging project at WPI. The project deals with improving the repair scheme for oil rig underwater reinforcement beams.

The road to developing this project, say graduate student Jerry Kulhowvick (Torrington, CT) and CE major Ed Williams ('85, Lunenburg, MA) has been, at times, a frustrating one, but the team hope the hurdles are behind them now.

Kulhowvick's interest in oceanographic and materials engineering led him to Sea-Con Services of New Iberia, LA.

Apparently, some of the beams of oil rigs' structures are periodically bent or fractured by equipment or boating mishaps. Many times the members are weakened from corrosion and need repair. Sea-Con, Kulhowvick learned, needed a research team to examine a troubling feature of its underwater repairing apparatus.

Most repairs are done underwater, where welding can be treacherous. Normally, the damaged portion of the beam is sandwiched in a sleeve welded onto the beam. These repairing devices are called "scalloped split sleeves," or SSSs.

Sea-Con's concern over the SSS was that it might be overdesigned. The unconventional scalloped shape allows for more welding area to ensure a secure bond between sleeve and pipe. Such a configuration is more expensive in terms of production, welding time and material, Williams explains.

Though he and Kulhowvick saw an opportunity in the dilemma for a challenging project, faculty advisors cautioned them about such an endeavor. As Williams points out, "The geometric shape of the sleeves makes any kind of analysis difficult. It's tough to get a feel for it."

Professors Frank DeFalco (CE) and Hartley Grandin (ME) agreed to supervise the students in their efforts. For Kulhowvick the project will be the subject of his master's thesis; for Williams it serves as his MQP.

Both students were familiar with a method of analysis called the finite element method (FEM). Briefly, FEM breaks the sleeve geometrically into many pieces and analyzes the stresses and strains on each of these elements. As might be expected, such a technique can quickly lead to a migraine headache if done without the aid of a computer.

At this point, Kurt Ross '81, an earlier thesis advisee of Professor DeFalco, got into the picture. At the time a software development engineer at Applicon, of Burlington, MA, Ross worked out an arrangement to provide Kulhowvick and Williams computer access at Applicon, a leading supplier of turnkey CAD/CAM systems. What is more, Ed Williams has since joined the company full time, while Ross has moved on to Pacific Telesis Group.

At Applicon the team fed the FEM computer system many different sleeve dimensions. They then reviewed the results of the computer's handiwork to determine if indeed the repair device was overdesigned and, if so, what design would be better.

To both students, this is more than just project work. Kulhowvick explains: "We definitely feel our work is valuable to Sea-Con. We hope that our results will ultimately save them money."

Postscript: How valuable has the study been? Well, consider this: Ten major oil companies have invested half a million dollars in an effort to review this same feature of their oil rig structures. Recently the WPI team received a $3,000 grant from several oil companies to underwrite their work. And this spring, Kulhowvick and Williams will travel south to oil country to present their findings to the petroleum industry.

Paul Allaire '60:

Holding the Reins at Xerox

Paul Allaire admits to being "keen on horseback riding," a sport which seems a natural for an executive on a fast track. And as the new senior vice president and chief staff officer of Xerox Corporation, he runs on a very fast track, indeed.

By Ruth Trask

The Xerox Corporation, including Rank Xerox and Fuji Xerox, is fighting a fierce battle with Japan for dominance of the world photocopier market, which is worth over $20 billion annually. At Xerox, Paul Allaire finds himself in the thick of the fray.

"During the past ten years, Japanese companies have become a major force in large sections of the copier market," he reports. "Through revenues from copying, Xerox still has nearly half of the world market," he explains, "but the Japanese command about 75 percent of total unit sales worldwide."

Allaire is helping to turn that latter figure around. And he has the track record to do it.

After receiving his BS from WPI ("I was a rather reluctant electrical engineer."), Allaire postponed graduate school plans to opt for a job as a "memory development engineer" with Univac in Philadelphia. He then worked for GE with NATO, devising an air weapons control system for monitoring airspace, identifying friendly versus hostile aircraft, guiding fighters and missiles against hostile aircraft. Subsequently, he earned an MS in industrial administration from Carnegie-Mellon University (CMU), Pittsburgh.

In 1966, following his graduation from CMU, he joined Xerox and held various financial planning and analysis posts before being named controller of marketing in 1969. He was promoted to director of financial planning and control for Rank Xerox (England) in 1970, and returned to Xerox headquarters in Stamford, CT, as director of international operations, financial planning and control in 1973. In 1974, he was appointed director of international staff.

Allaire returned to London as chief staff officer and executive director for Rank Xerox in 1975. Later, he was named managing director of Rank Xerox.

As managing director of Xerox in England, Allaire was responsible for company operations in 80 countries stretching from Ireland to New Zealand, from South Africa to Finland. He says he enjoyed "the greater management challenge" of dealing with people in the Eastern Hemisphere and his adjustment to life as a resident of the United Kingdom.

"I like working with different people," he continues. "Besides the normal business problems, you have different cultures, laws and currencies."

Allaire took over the leadership of Rank Xerox when it was striving to get back the market for lower-cost machines, a market in which Japanese competitors had made great inroads. With his guidance, Rank Xerox developed new merchandising techniques. In March 1983, London's Lyric Theatre reverberated to a spectacular audio-visual show complete with flashing lights, powerful music and swirling stage smoke. The audience came from all over Europe.

Said London's *Financial Times*, "Even cynical City analysts caught themselves clapping the 'stars' of the show, a new range of photocopiers from Rank Xerox. It was an astounding performance, a major piece of entertainment."

Debuting at the show was the Xerox "10 Series," which is aimed directly at the most competitive copier market—low- and medium-speed machines, where the Japanese have made such market gains.

"The 10 Series is a real breakthrough," Allaire reported during the London extravaganza. "The copiers are much more sophisticated, with considerable use of microelectronics. This gives them much better copy quality and reliability."

After eight years of progress in London, in July 1983 Allaire was brought back to Xerox headquarters in Stamford, CT, and named senior vice president and chief staff officer. In his new role, he is responsible for all staff functions at corporate headquarters, including strategy, planning, finance and control, personnel, technology, and information systems.

He explains, "It's a fascinating opportunity to participate in the worldwide development of Xerox as it moves from a copier company to a full-line office automation company." His engineering background serves him well in the new area of sophisticated electronics, including professional workstations, electronic printers, electronic typewriters and fully interconnected systems via local area networks.

Paul Allaire's past record and background indicate that he knows how to move Xerox successfully into this exciting new area. The man now holding the reins at Xerox knows well how to get his company into the fast lane—and how to keep it there.

Allaire (left) visiting WPI's Manufacturing Engineering Applications Center with MEAC Technical Director David Asmus.

Tooling Up for the Computer Generation

The widening role of computers in science and engineering is hastening dramatic changes in how we educate future practitioners in these fields. Yet at WPI, as elsewhere, the best way to do this may not be as obvious as it appears at first blush.

By Evelyn Herwitz

Sitting at his AT&T personal computer, Assistant Professor of Electrical Engineering David Cyganski '75 types a few commands. For a split second, the CRT goes blank. Then, starting in the bottom left-hand corner, a series of numbers appears on the screen, identifying the points in a matrix.

"Now, let's create a simple circuit," says Cyganski. He types a few more instructions, and the computer traces a schematic diagram linking four points in a rudimentary closed circuit. More keyboard strokes, and the screen again goes blank, this time filling with a graph of circuit test results.

"We're developing a toolbox—one that makes the mechanics of electrical engineering very simple," explains Cyganski. "That enables us to dwell on principles and do some very deep teaching." Working with National Science Foundation funding to develop computer graphics software for electrical engineering courses, Cyganski and several other EE faculty are just a few members of the WPI community finding innovative ways to integrate computers into the curriculum.

Over in Higgins Laboratories' "APTLAB," which houses 20 AT&T PC and 18 Apple desk-top computers, Associate Professor of Mechanical Engineering Robert L. Norton is teaching students the basics underlying CAD (computer-aided design) systems.

"The problem involves taking three-dimensional information and putting it on a two-dimensional screen," says Norton. Assignments range from designing a program that rotates a predefined shape on the computer screen to student-designed projects. One, called "The Pilot's Nightmare," leads the viewer through successive, pilot's-eye views of a runway as a plane approaches and then misses its target.

"In the past," says Norton, "the only way we could do these manipulations was with drafting tools. The drawings would take you three hours." Now, swapping T-squares for mathematical algorithms, Norton says, students can achieve the same results in a fraction of the time. "It gives them a good sense of the limitations and uses of CAD systems."

In the Computer Science Department's Human Computer Interaction Lab, one of several specialized department laboratories, students work with computerized mini-robot arms, graphics terminals, and voice input and output apparatus. Worth

about $30,000, each workstation consists of one of six Digital Equipment Corporation (DEC) PDP 11/23s and a variety of special interface devices. Two VAXStations—high performance graphics computers—are valued at $15,000 apiece. Much of the equipment was acquired from DEC as part of an educational research grant.

"These are not simple, plain-vanilla setups," says Mark R. Ohlson, Assistant Professor of Computer Science. "The computer stations are geared to experimentation, so the students can find ways to interface with non-standard devices." Ohlson says lab use ranges from coursework in real time programming to special projects, such as a blind student's experiments with digital sound recording and playback.

For those just learning to program, the Computer Science Department operates a separate lab equipped with an IBM Series I and 30 IBM PCs, as well as a Data General MV8000 and 24 time-sharing terminals. One of a half-dozen recipients nationally of an IBM grant, the department has developed specialized software to create a controlled lab environment. "The students can see exactly what happens in the machine for each command," says department head Professor T.C. Ting.

But computers at WPI are not found only in the computer science or engineering departments.

Last term, Professor of English Lance E. Schachterle required students in his writing course to do all their work on word processors. Two other Humanities Department faculty members, Professor of History John F. Zeugner and Associate Professor of History Patrick P. Dunn are developing an international diplomacy simulation, while German lecturer Lieselotte Z. Anderson is working on an interactive program that will teach German. And Associate Professor of History James P. Hanlan is developing a data base using the U.S. Census for his urban history course.

Computers are nothing new to WPI, which has had mainframe facilities for several decades. What *is* new is the personal computer, and the search for ways to further student education using this powerful teaching tool. As the microcomputer revolutionizes higher education throughout the country, WPI is grappling with a new challenge: how to "computerize the campus."

"It's clear that engineering colleges in particular will be expecting graduates to be computer literate," says Dean of Academic Computing Owen W. Kennedy, Jr. '45. "The question is, how do you get to that point?"

To begin to answer that question, several members of the WPI community spent the past two years on a Computer Advisory Committee (CAC), drafting a plan for developing a comprehensive information resource on campus—or, exploiting the power of the computer at WPI far more than ever before.

Among the CAC's recommendations, endorsed by faculty members last February, were the need to develop a campus-wide network of compatible computers, and to make microcomputing workstations available to virtually every student and faculty member—all within five years. Kennedy estimates the cost of implementing the plan to be $10 to $15 million.

"We used to think that, if we had enough time-sharing terminals around the campus, that would be sufficient. But to stay with the trend of engineering colleges, we decided to go the PC route," says Kennedy, a professor of Electrical Engineering whose newly created office was set up last summer with a $200,000 grant from the George I. Alden Trust.

"We want to make sure all students have ready access to computers," he continues. "If the students have the PCs where they live, the great benefit is that, at the time they have the motivation to use the computer, it's there."

For students to be able to use their PCs in their dorms, however, several things have to happen. First, they need the microcomputer itself, as well as software to use and coursework to do. Second, they need a system to plug into.

As to the latter issue, WPI already has the beginnings of a campus-wide computer network. A wide-band, 9600-baud Virtual Terminal Network (VTN) connects several VAX and numerous PDP-11 minicomputers, a Data General MV8000, a Computervision CAD system, and two mainframe computers (a UNIVAC 90/60 and a DEC 2060) in the Worcester Area College Computation Center (WACCC).

Fashioned by WPI faculty and students, the VTN enables users to access different

Michael Carroll

An educational research grant from Digital Equipment Corporation enabled the Computer Science Department to develop four computer labs, like the one at left, all tied in to the VAX 11/750 minicomputers, shown in the background. This lab focuses on human-computer interaction. Chemistry is an area that has made significant progress recently in introducing computers to the curriculum (above).

machines with a range of software and computing power from several terminal clusters around campus. "Handshakes between computers—that's what we wanted the VTN to do, and that's what it seems to be doing," says WACCC director James J. Jackson, Jr.

While the VTN is working well enough, however, it is considered only a first step. "We couldn't afford to buy a network so we built our own," says Jackson. "They bought the equipment from hobby kits."

"The VTN is a tentative solution that won't solve the long-term problem," agrees Professor T.C. Ting, a CAC member along with Jackson. "Our goal is for each campus building to have a local network with some computer service, including a large storage device and printing facility, to make it mostly self-sufficient." Ting says student and faculty personal computers would plug into each building's local network, so the user could also access more powerful machines across campus.

"Each local network would have a gateway to a campus-wide, wide-band network linking all buildings," says Ting. "The mainframe would be the backbone of the system for communications and large, sophisticated operations requiring more memory. It would also connect to a large central gateway hooking up to networks outside of WPI, like Telenet."

Currently, Computer Science is the only department on campus to have a local network in place. Two narrow-band, 10-megabyte ethernets link three VAX 11/750s with 14 PDP 11s, supporting a variety of computer applications labs and department office automation and research.

Dean Kennedy estimates the cost of installing a permanent, campus-wide network to be in the millions. Although funds have yet to be identified, current plans call for the network to be in place within three years.

Even as the groundwork is laid for a comprehensive computer network, however, the college is already moving on the companion issue: how to equip students and faculty with their own personal computers—and ensure that the machines speak the same language.

"We have to have the same or compatible equipment across campus to eliminate the 'Tower of Babel' problem," says ME's Norton, another CAC member.

Following the CAC's recommendations, a Computer Selection Committee (including Norton) spent five months last year searching for what has now been identified as the campus standard: the AT&T 6300 PC. Chosen for its compatibility with the IBM PC, the AT&T 6300 was also favored for its high operating speed and quality graphics, plus built-in standard features.

To enable faculty to begin developing software programs and adapt curricula to microcomputers, WPI has so far acquired 140 AT&Ts. Over half the machines have been resold at a discount or put on loan to faculty, while 30 PCs have been placed in two student computer labs. In addition, each department office has one PC, and a small number have been sold to students.

But a larger problem remains: how and when to provide PCs for all WPI students. While much of the Institute's computer equipment has been donated by manufacturers, in this case AT&T is discounting the purchase price to just over $2,000 per machine.

Faced with the problem of who pays for PCs, some institutions, like Clarkson University, have given freshmen their own Zenith-100s, covering the cost through tuition increases. Others, like Virginia Polytechnic Institute, require an outright student purchase of an IBM PC or PCjr. By contrast, neither Carnegie-Mellon University nor the Massachusetts Institute of Technology make their students purchase PCs because administrators feel the right machine isn't yet on the market.

Dean Kennedy anticipates two possible scenarios for WPI's PC purchases. "We could go with the Clarkson model, where the school keeps ownership of the machine, which is supplied to the student as part of an increased tuition fee," he says. "Over four years the PC would be essentially paid for and the student could purchase it for a nominal fee."

The other alternative, he says, is for students to make a down payment on the PC when they arrive as freshmen, and to pay off the balance over the course of four years. In either case, he expects students will need to own computers by the fall of 1986. By that time, Kennedy anticipates enough courses will have been modified to incorporate microcomputers as teaching tools.

For William Supernor '87, an ME and design major, requiring students to own PCs is a necessary, albeit expensive step.

"I think it's about time," says Supernor, who is head monitor in the APTLAB. "I would like far better to have a computer in my room than to have to come here and use it. I know if I had a computer, I could do so much more." Cost is the major obstacle keeping Supernor from buying one of the AT&Ts today. "Two thousand

dollars is a lot of money," he says. "It would be nice if the cost was subsidized by the school or spread out over four years."

Opinions vary among faculty and staff members as to whether students should have to buy the PCs. "I hope it doesn't happen, but I expect it will," says WACCC director Jim Jackson. "I think it's wrong to shift the financial responsibility from the school to the students. Tuition is high enough now."

While he favors the use of PCs, Professor Norton is also concerned about how the proposed requirement would affect students' wallets as well as the curriculum. "It makes a lot more sense to introduce computers at the higher levels, when students know the paper and pencil fundamentals," says Norton. But, he says, that would give them only two years to pay for the machines, which could be prohibitive for some. If students are required to buy PCs as freshmen, Norton hopes that underclassmen would use the microcomputers primarily for word-processing. That way, he says, they would still have four years to pay for the machines instead of only two, without sacrificing mastery of basic skills.

There is also the issue of who should bear the cost of rapidly changing technology. "It's like trying to shoot a moving target," says Professor Ting. "I want to see WPI be a leader in the long term, not the short term. We don't want students to buy a PC that has a minimum capability and doesn't suitably meet the needs of engineering students. Other schools are requiring students to buy PCs," he points out. "But what happens? Are we going to continue to upgrade the campus system or pass the buck to the students?"

Requiring students to purchase equipment that may become obsolete before they graduate is also a real concern for CAC chairman Kennedy. But he thinks that the lost opportunities resulting from waiting for the perfect machine to come along are even greater. "If you wait a little longer, you may get a better deal, but you lose a year learning to use the microcomputer," he says.

Michael Carroll

Marvin Richmond

Michael Carroll

Professor Owen W. Kennedy, Jr. '45, Dean of Academic Advising (right): "The computer plan we envision for WPI may cost upwards of $15 million." Management Associate Professor Dieter Klein, a CAC member (bottom right), works to help industry integrate computer technology with its manufacturing operations. The APTLAB, where some 40 Apple and AT&T personal computers are in almost constant use (below).

Associate Professor of History Jim Hanlan thinks the best answer may be simply to let the market regulate itself. "Twenty years ago everyone was walking around with slide rules," says Hanlan. "Today, you can't imagine a WPI student without a calculator, but we don't require them to buy calculators. Eventually, students will want to have PCs, and it won't have to be a requirement."

However the machines are eventually acquired, there remains the cost of software and maintenance.

"The popular Lotus software package at the deepest educational discount still costs about $200 a copy," says Associate Professor of Management Dieter Klein, also a CAC member. "It would cost in the neighborhood of $1,000 per student just for software."

"Up to now, software companies have not been sympathetic to the problems facing colleges," agrees Kennedy. "They set high prices and are reluctant to give good educational discounts." But he is encouraged by pricing decisions of vendors such as Borland International, whose TURBO Pascal sells for close to 50 percent under list price in the campus bookstore. "Things will get better as more and more vendors follow suit," he says.

As for maintenance, Kennedy has set up a shop on campus. "We will handle warranty and non-warranty jobs," he says. "Our goal is to be able to repair PCs within a day." Users will pay for replacement parts and labor, but Kennedy says the cost will depend on how fully the college decides to underwrite the operation.

Even as the details of implementing the CAC Master Plan are debated, however, the WPI community is in agreement that the Institute is moving in the right direction.

"We can't expect it to happen overnight," says Professor Hanlan. "If it did, I'd be afraid we had moved too hastily. I don't want us to just grab a gimmick, but rather to use the personal computer in a way that is pedagogically significant."

And if all goes according to plan, that's exactly what will happen at WPI. "Five years from now, I think you'll see the usual classroom scene, except there will be more specialized classrooms equipped with PCs at each desk and a large screen in front," speculates David Cyganski. "We'll be teaching the same material—we'll just have better tools to use."

Evelyn Herwitz is a freelance writer living in Worcester.

The microcomputer is having a macro effect on higher education. What's a college to do? There's no one right answer—yet.

By Judith Axler Turner

BIG MACHINE ON CAMPUS

It's a given: The computer, that box of silicon and plastic, is changing the way we gather, process, and store information. And because colleges and universities are the prime information creators and vendors in this information age, the computer revolution is nowhere felt more strongly than on the nation's campuses.

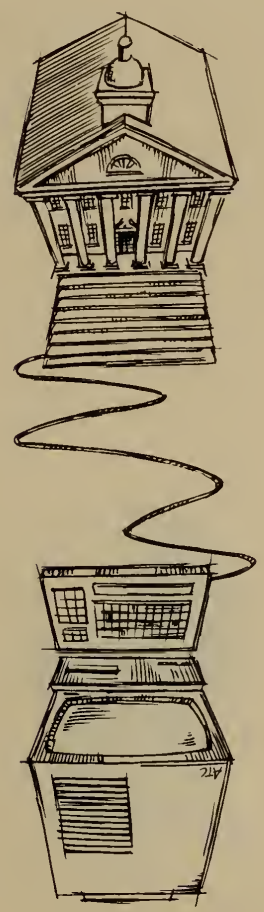
Computers at college are nothing new. The first electronic digital computer, ENIAC, made its home on two floors of the Moor School of Electrical Engineering at the University of Pennsylvania in 1939. Its electromechanical predecessor, the MARK I, was designed at Harvard University a few years earlier. Today analysts figure that between a quarter and a half of all computers are at colleges and universities.

Until a few years ago, most computers on campus were available only to researchers and computer-science or engineering students learning how to program. Then the microcomputer was invented, and the revolution began.

The microcomputer, also known as the personal computer, is distinguishable by its affordability. Most cost under $5,000 for an entire system: the computer itself, the screen that displays the words or graphics, the keyboard, the disk drives that allow information stored on magnetic disks to be loaded into the computer, and even a printer to make what computerists like to call a "hard copy."

The microcomputer is an outstanding teaching and learning machine. It collects, stores, massages, analyzes, rearranges, and serves up information, the currency of education. Its usefulness in higher education is such that no one blinked when Talmis, a computer-industry research firm, predicted last spring that by 1987 four million college students—one third of the nation's undergraduates—would own microcomputers, and colleges and universities would own another half million.

"In many ways, the microcomputer revolution is an access revolution," says Gary Judd, vice provost and dean of the graduate school at Rensselaer Polytechnic Institute. Computers have been around for five decades, but the microcomputer means a student can have this wonderous information machine on her desk, doing her work. The revolution is one of expectations: students expect to need to know how to use a computer, expect to be able to use one, expect to have one to use.



They are applying in large numbers to be computer-science majors, stretching the ability of most computer-science departments to handle them. Many institutions, including the Massachusetts Institute of Technology, have cut off computer-science enrollments. Others require computer-science majors to maintain higher grade-point averages than students in other fields. Some universities require computer-science majors to take and pass extremely difficult courses designed to weed out the less able.

But the deterrents aren't working. For every student thwarted in his attempt to major in computer science, others are crowding courses that give them an account on the central computer or teach them to use computers—programming courses and courses in statistics, business, and engineering. Students and professors are asking for, and often getting, the right to use the university's computing facilities for courses that once were strictly low-tech—history and English courses, for instance.

Academe is not unhappy with this revolution. Administrators are eager to meet student demands for computing power, to guarantee that graduates of all institutions—from "Star Wars" computer-intensive institutions like MIT, Carnegie-Mellon University, and Stanford University, to small colleges still trying to make do with three computers in the engineering department—are sufficiently familiar with this new tool to make it work for them. The challenge is for the colleges to find a way to integrate the computer into campus life.

About eight years ago, Rensselaer Polytechnic Institute decided to expand and upgrade its computing facilities. It was time to move from batch computing to a distributed system. No longer was all computing to be done by professionals at a central location. Now professors, students, and staff members would be able to interact with the computers directly, from terminals in dormitories, the library, and the computer center.

"We expected the transition would take five or six years," says RPI's Judd. "But it happened almost overnight." RPI found what other institu-

tions have discovered since: The demand for computing cannot be overestimated. There are always people ready to take advantage of computing power.

There is, of course, a darker side to the eagerness to use computers, and that is the cost. Because a little computing seems to fuel the fires, setting up demands for more, many institutions feel pressured.

"There is a tendency to look at what is not done," says Linda Eshleman, associate professor of mathematics and computer science, and director of academic computing at Western Maryland College.

Next fall Western Maryland plans to open a word-processing laboratory, filled with microcomputers, for use by students in English classes. Science students are already using microcomputers in their laboratories, and social science students use the terminals to the large mainframe computer to do their statistical studies. Eshelman says this is not enough: "I wish there were more computers."

Computers, and everything that goes with them, cost money, big money. The Stevens Institute of Technology, after committing millions of dollars to instituting a computer-purchase requirement for alls its freshmen in 1983, found it had another big expense on its hands. All the dormitory rooms had to be remodeled. Student desks were not big enough to hold the computer the college had chosen, and there was not enough floor space in the room to put in bigger desks. Stevens ended up spending $500,000 to remodel those rooms, replacing the twin beds with bunk beds, and building in new, big, sturdy desks.

Even if the dormitories do not have to be remodeled, computing is expensive. (There *are* some ways to lessen the costs: For example, when Hartwick College did a general re-wiring of its campus five years ago, it put in the cables needed for an eventual campus-wide computer network.) Franklin and Marshall College president James L. Powell thinks that within a few years all colleges and universities will have to spend on computing the same percentage of the budget they now spend on libraries—between 5 and 7 percent, he says.

Some think Powell's figures are low. Computing does not start and end with the provision of computers for academic and administrative work, says Vinod Chachra, vice president for computers and information systems at Virginia Polytechnic Institute and State University. Computers link information delivery systems, including telephones, the library, the printing and reproduction center, as well as academic and administrative computing. The expanded province of computing, says Chachra, can account for more than 10 percent of an institution's annual budget.

Some colleges and universities are trying to lighten the budget load by putting some of the costs directly on the students. The most popular method is to require or strongly urge students to buy their own computers.

Newspapers seem to be filled with stories of freshmen registering for classes and being given a personal computer to take back to the dorm. But if this is a trend, it has yet to catch on. Right now fewer than a dozen colleges and universities give students their own computer, or require students to buy one. According to *The Chronicle of Higher Education*, those institutions currently requiring incoming students to have computers are Clarkson University, Dallas Baptist College, Drew University, Drexel University, the University of Michigan's college of engineering, the Polytechnic Institute of New York, Stevens Institute of Technology, the South Dakota School of Mines, and Virginia Polytechnic Institute and State University's college of engineering.

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David Bray, dean of Clarkson University, says there is no way the university could have afforded to provide so much computing power if the students had not paid for it directly. Other institutions say requiring students to buy computers still cost the college money. Dallas Baptist University, Drew, and Virginia Tech say they had to lay out at least a million dollars each to implement the computer requirement.

Franklin and Marshall College seriously considered requiring students to buy computers beginning next fall, but after months of discussion the administration decided to put off the requirement for a few years. Instead, F&M freshmen will be strongly urged to buy the Apple Macintosh computer, a suggestion sweetened by a special $1,340 price on the $2,300 computer.

One reason freshmen are not being required to buy their computers is because so many of them—about 20 percent, according to a survey at the college—come to F&M with computers, and administration officials believe that most of the rest will decide to buy computers when they get to Lancaster. To encourage them to buy the Macintosh, F&M sent a pamphlet to all prospective applicants, telling them of the computer's place at F&M—and about the discount price.

President Powell does not think many students will turn down the opportunity to purchase a computer at a discount. "It is a rare student who doesn't have a stereo or a $500 typewriter," he says. And he strongly believes that it is necessary to have a single computer for everyone so software can be developed and exchanged easily, and students and faculty members can help one another when problems arise. "Instead of letting a weed patch grow," he says, "we are turning it into a garden and letting it flourish."

Rensselaer Polytechnic Institute considered a computer requirement, but decided against it because students are well served by what Vice Provost Judd calls "a rich and accessible public system" in its campus network. A network links

Judith Axler Turner, an assistant editor at The Chronicle of Higher Education, *often writes about the impact of computers on campus.*

computers and terminals; a student can use RPI's large mainframe or minicomputers from terminals or microcomputers all around the campus.

Like other schools with powerful networks, such as MIT, Stanford, and Dartmouth College, RPI is more concerned about the "mix"—the right combination of microcomputers, minicomputers, and mainframe computers—than about providing computing power. While personal microcomputers might make life somewhat easier for students (RPI's engineering school is considering requiring purchase for this reason), Judd does not want to rely on them. "The personal computer can only go so far," he says. "You need more powerful computers for different jobs."

Judd is not concerned that the increasing numbers of computers purchased by faculty members and students will introduce Powell's "weed patch" of incompatibility. "People select a useful solution," Judd says. "Even though we have not yet taken a formal position, a majority of the purchases are the same. There seems to be a common wisdom." Most of the purchasers are buying IBM or IBM-compatible machines, or taking the Macintosh route, he says. Either one will work with the powerful RPI campus computer network.

But not every school likes the network, or thinks it answers all problems. Dartmouth College, where the first campus network was created in the 1950s, has been moving toward microcomputers. Last year Dartmouth offered its students a 60-percent discount on Macintosh computers, with the option of using them as a terminal to the campus network. About 80 percent of the freshmen and 50 percent of the sophomores, juniors, and seniors have already bought Macintoshes, says William Y. Arms, vice provost for computing and planning at Dartmouth.

One college that plans to require incoming freshmen to buy computers is Worcester Polytechnic Institute. WPI will require freshmen to buy the AT&T 6300 computer beginning in 1986—if the college is ready by then.

"We don't want to require it until we are sure students will use the personal computers in a significant number of courses," says Owen W. Kennedy, WPI's dean of academic computing. The goal, he says, is to have students "computer fluent" when they graduate—comfortable with using the computer to solve problems. If we work the computer into a significant number of courses and use it in all different contexts, students will become computer fluent, using the computer without having to think about it," he says. To make the purchase worthwhile, Kennedy estimates, students need to use computers in about half their courses.

Most commercial education software is not very good, academics agree, and to fill the software gap colleges are encouraging their professors to write programs. WPI is giving faculty members loaner computers and some teaching-free time to write their software.

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Word processing has turned equipment-scarce disciplines into equipment-intensive ones—and they are demanding their share of the equipment budget.

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Faculty members at Villanova University can borrow $1,000 interest free from the university, for one year, to help pay for a microcomputer, says Philip G. Charest, executive director of the university's comuting and information services. With a grant from the George I. Alden trust, WPI faculty are developing programs for use across the curriculum.

Fifteen RPI professors are writing software this year, supported by a grant from a trustee. In addition, says Robert Gallagher, RPI's director of computing services, IBM will loan 100 computers to faculty members for nine months. Gallagher will give priority to professor who have no prior experience with microcomputers, in the hope that he can expand computer use on campus.

Franklin and Marshall hopes to use software developed on other campuses for the Macintosh, but will hire what President Powell calls "a computer hacker" to help faculty members who want to develop their own software.

Programs to help faculty members develop software are working well on campuses across the country. At Stanford University, for instance, a history professor has developed an adventure game that allows a student to pretend he is an aspiring nobleman in the court of the Sun King, Louis XIV, to better understand French society. At Hiram College an English professor developed a computerized verse-writing laboratory to help students write poetry, complete with a random first-line generator for poets with writer's block. The money for the project came from venture capital raised by the college's trustees.

Drew University committed a large chunk of money to providing time, funding, and support to faculty members who want to write software. As a result, there are Drew-written programs in most departments. In chemistry, students do some of their experiments on the computer, with software that simulates the laboratory instruments. The computer shortens the time it takes to learn to use the instruments, the professor says, letting students concentrate on the experiment and not the mechanics.

Although the computer is usually thought of as a number cruncher, it is in reality an all-purpose tool. Nowhere is that more obvious than in liberal arts colleges, where the primary use of the computer seems to be for word processing, that ability to write and edit text on the computer. Word processing has, in fact, turned equipment-scarce disciplines to equipment-intensive ones. English departments, which once helped to defray the cost of laboratory equipment for the sciences, are now demanding their share of the equipment budget. At Western Maryland College, for example, the new 20-computer word-processing laboratory was proposed by the English department.

At other institutions, the computers are still used primarily by traditional science and engineering classes. Hartwick College, for instance, has rapidly expanded its computer system, but still limits

computer use to those classes in which computer work is required by the professor. "We say if it is legitimate course work, legitimate research, you can get all the time you need on the system," says John C. Moulton, assistant vice president for information services at Hartwick. "We would love to have enough equipment to have enough computers for everyone, but rather than raise expectations, we limit the use of the computer on a course-by-course, project-by-project basis."

By fall, Hartwick's library will have a stand of personal computers, with software, that students can reserve for use. Word processing will be possible on Hartwick's mainframe system next year, Moulton says. Until now the college has kept students from using the system for word processing by a very simple device: there is no letter-quality printer on the system, and professors are reluctant to accept papers printed on the hard-to-read dot-matrix printer.

Most institutions have a problem with word processing, because of the enormous amounts of memory and computing power required for all the students who need it—engineering and science students as well as liberal arts types. Yet word processing may be the single greatest contribution computing can make to an educated person. It enables a writer to rewrite and rewrite again.

"Somebody said good writing is rewriting," says F&M's Powell. His college has a writing-across-the-curriculum program in which writing is emphasized in every course, and Powell believes the personal computers will help this process.

Drexel found this to be the case: the school's cooperative students, who work in local industries, are highly valued for their engineering and business skills, but receive low marks for their communications skills. One reason Drexel chose to require students to purchase a computer was to increase their writing skills.

Other new courses are computer-literacy courses. These course are not as computer-intensive as most computer-science courses, but they still strain the computing facilities. And they are some of the most popular courses on campus, because students realize that familiarity with the computer is vital to understanding the society they will enter.

Villanova's Charest, who teaches "Computers in Society," the college's lowest-level computer course, finds that the mix of students who take it is enormous, from nursing majors to business majors. His focus, he says, is the difference the computer makes in how we live our lives, and each student brings something to the course.

Hartwick College, too, recently instituted a computer-literacy course, mainly because so many students were taking the beginning BASIC course designed to teach that programming language, and "Their programming skill never developed," says Gary E. Stevens, chairman of computer and information science. Now Hartwick has an advanced BASIC course and the computer-literacy course that covers a little programming and a lot of explanations about what a computer is and how it works.

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Microcomputers have produced a revolution of expectations: Students expect to be able to use one. They expect to have one to use.

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But the cycle is vicious for colleges with limited resources. Word processing, statistical packages, computer literacy and history games on the computer mean more students want to use the machine, and that means colleges and universities have to come up with the money to provide computing.

Some institutions are fortunate enough to have grants. Villanova, for instance, has nearly three-quarters of a million dollars worth of computing equipment from IBM, Digital Equipment Corporation, and Intel. At Hartwick, a grant from the Pew Memorial trust was used to buy computers and software. WPI has $2.4 million for hardware and research on computer lab teaching techniques from Digital.

But Western Maryland College believes it has missed the boat when it comes to getting industry grants, Eshleman says. The only opportunity institutions like Westerm Maryland College still have is a hefty academic discount on computing equipment. Sometimes this discount can be passed on to students: Villanova last year had two computer fairs, where major equipment manufacturers offered students and faculty members discounts of at least 30 percent on hardware and software.

Some institutions are trying to create their own funding opportunities. Christian Brothers College has set up an arrangement with local industries to provide training for telecommunications workers—in return for funds for faculty hiring and equipment purchases.

Other institutions are looking for ways to make computing less expensive. One popular approach is to do all necessary repairs and service on campus. Columbia University figures it will save some $300,000 this year just by putting all its computing equipment under the same service contract, to be handled by an on-campus shop. F&M, RPI, and WPI all intend to develop in-house expertise for repairs.

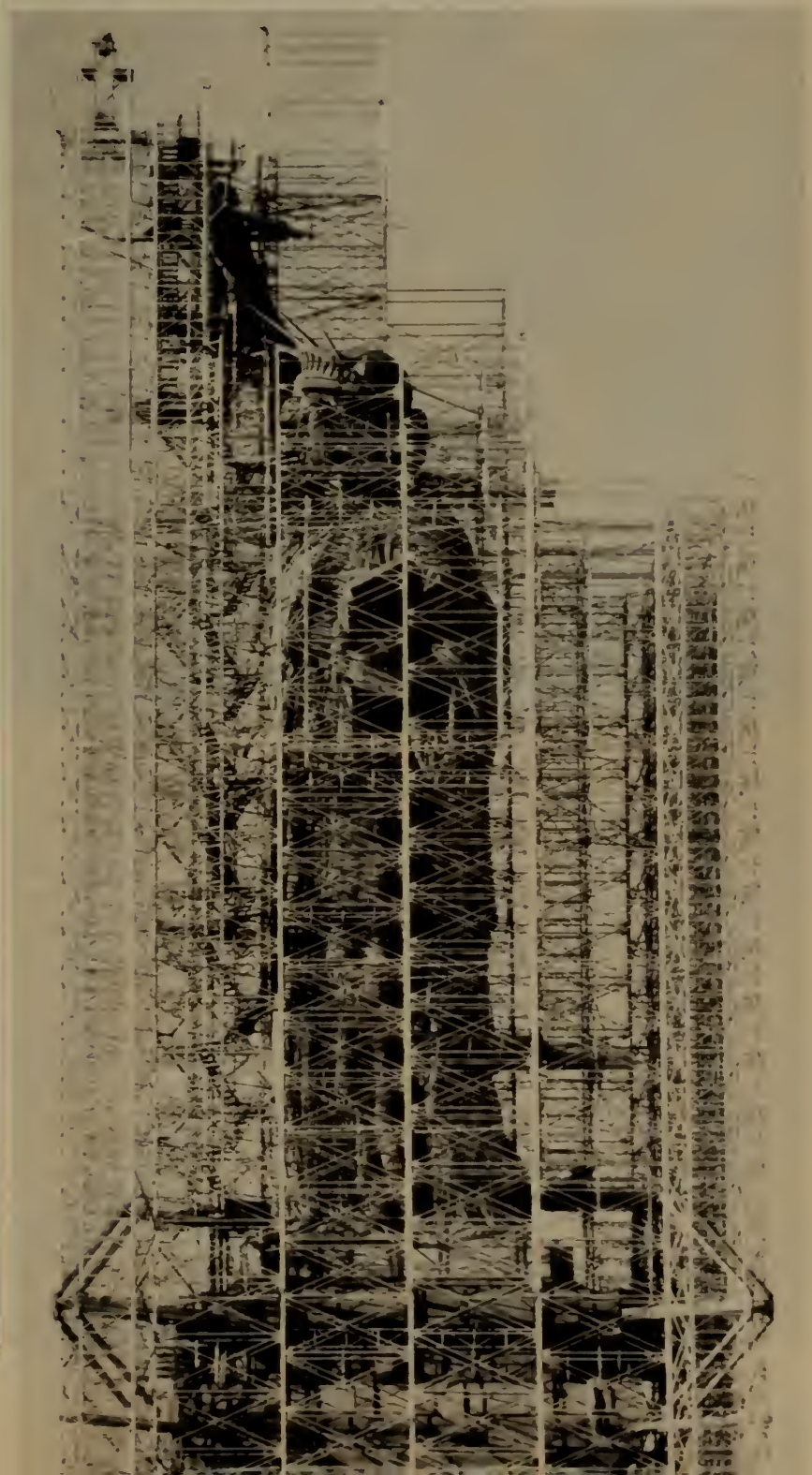
Villanova, which recently did a preliminary inventory of hardware and software on campus to find out what could be included in a service contract, went a step further than repairs. "So many people came to us asking about software or microcomputers we had never heard of, that we decided to find out who knew anything about them, and use those people as experts," Charest says. Now, if a student or professor wants to know how to do something on a data-base program, for example, Charest will be able to send him to a user who has probably done it.

Computing on campus is still in its infancy as far as using it for teaching and learning is concerned. No one knows yet how best to provide computers, or how best to use them.

Yet one thing is certain: students expect computers to be a part of their life. It's an expectation colleges and universities must decide how to meet.

By Marshall Ledger Photographs by William Denison

LIBERTY REDUX



A century ago, the Statue of Liberty was an engineering marvel. Today, restoring it is a monumental project. The statue looms large in the American imagination.

The Statue of Liberty belongs first to the mind. We know it intimately before we ever see it—the thrusted torch; the impassive, even hard, face; the crown of spikes; the left arm cradling a book stamped "July IV MDCCLXXVI"; the massive folds of gown; the green color; the monument's position on Liberty Island in New York Harbor, the mainland behind it.

We imagine, too, that we know all about the statue's meaning—a symbol of welcome to immigrants who sailed from oppression to something better (perhaps America's greatest cliché, although no less true for that), living up to the allegory that is its title.

And if we give our minds free rein, we can make other connections—the immensity of the statue representing the grandeur of American ideals; or its physical isolation and sculptured sense of movement standing for the exalted individual bound in an enterprise. (I think of such disparate images as Edwin Arlington Robinson's "man against the sky" and Henry Kissinger's unguarded sentiment expressed to Oriana Fallaci: "I've always acted alone. Americans admire that enormously. Americans admire the cowboy leading the caravan alone astride his horse.")

These meanings are there—plus many others, accrued through history, which we scarcely know. There is, in fact, a lot more in the statue's physical presence and meaning than the architectural and sculptural colossus we picture in our minds. And that is why it is always worth a visit.

Disbelief, however, is my first reaction as I view the statue from Battery Park in the afternoon of an overcast day. The figure of Liberty seems caught in a rigid spider web—the scaffolding constructed to enable workmen to refurbish it for the centennial in 1986. The tubular framework rises higher than the arm, now that the torch has been removed. Through it, still, emerges the feeling of upward motion, the skyward sweep molded by Frédéric Auguste Bartholdi, the sculptor. I never

did understand the 19th-century critic who scoffed that, from this vantage point, the statue looked like a sack of potatoes raising a stick. But there is no escaping the suffocating feeling of a cage.

George I. Hoehl thinks the scaffolding is a marvel. The Villanova University graduate is vice president of Lehrer and McGovern, the construction-management firm in charge of the renovation; he is project chief. He points out that the scaffolding amounts to 300 tons of aluminum tied together in such a way that it is perfectly stable, yet does not touch the statue, so the temporary rig cannot transfer any corroding elements.

He draws my attention to the corners. Instead of being square, they are octagonal in order to increase the load they can bear; the load is then shifted to the support system of braces, which look like arrows from here. The octagonal system is strong; one supported the crane that removed the torch and flame—that part of the statue weighed 3,600 pounds. As Hoehl talks, I sense his engineer's pride in being able to deal with a complicated structure that stretched the imagination and technology of those who devised it more than a century ago.

His responsibilities are also a job, a job to be done on schedule—by July 4, 1986—and to be done right. A lot of money is at stake: Renovation will cost some $30 million for the statue (the statue is the focal point for a $230-million rehabilitation which includes the remainder of Liberty Island and neighboring Ellis Island as well). Respect is at stake, too. The money is being solicited from the public, which, no doubt, considers the statue its own.

To do his job, Hoehl tries to avoid being "caught up in the aura of it." He gets caught up, anyway. After the torch and flame were removed, the flame was shipped out to Pasadena for the Rose Bowl parade in January, giving him a flavor of what it must have been like to dismantle the statue in Paris, where it was first erected, and ship it, in 85 crates, to the United States. The flame's parade appearance was sensible; in soliciting money nationally, the Statue of Liberty-Ellis Island Foundation wants to carry the "event" of the renovation beyond New York so that it does not seem—as the erection seemed to some a century ago—simply a local production.

To reach the statue, Hoehl and I take the launch which transports the workers daily on their 15-minute ride to the job. We head for the work-

The head, perfectly recognizable, is frightening in size. It is easy to see why Gulliver, close up, found the Brobdingnagians repulsive. The nose is 4 feet, 6 inches; a fingernail is 13 inches long, 10 inches wide.

ers' dock, on the near side of the island, to the left of the statue. On some mornings, Hoehl says, the sun hits the scaffolding so directly and reflects so forcefully that the aluminum bands seem to disappear, letting the statue stand free once again. The dankness of this day creates no such mirage.

Both statue and scaffolding grow as we near the base. One of this country's experts on American myths, Philip Young, who teaches at the Pennsylvania State University, recalls dining at the Windows on the World restaurant, where he looked out to see the statue figuratively leap up in the spotlight. He talks about "the great truth" expressed by the statue as a symbol and suggests that it bears that truth, too, because of its daunting size.

On water, however, you can lose yourself in sections of the picture. Most noticeable are the contrasting additions to the pedestal—a temporary and graceful ramp from the dock to the pedestal entrance, used to transport supplies; and an ungainly block of concrete, built by the National Park Service more than a decade ago and housing the Museum of American Immigration.

After docking, Hoehl and I ascend the scaffold in an elevator, a sort of self-climbing, rack-and-pinion device that shoots noisily by the statue's upraised arm. We rise to the point of the amputation.

The spikes of the crown look massive, yet frail; some, it is clear, are so corroded that they will be replaced (not for the first time, either). The simulation of hair, the wavy lines in the copper, are significant grooves. The breast, which even from the ground appears sexless, looks like Victor Mature's from here. The arm is so large, it is virtually indecipherable. The head, perfectly recognizable, is frightening in size; I can see why Gulliver, close up, found the Brobdingnagians repulsive.

The stillness up here, however, offers relief, and the famous elements become familiar again. Hoehl speaks of them as a doctor might speak of a patient's biopsies. Although the copper "skin" is generally in good condition, he says, X-rays have disclosed spots weakened by corrosion; they will be patched. Hoehl is often asked whether the surface will be polished. The answer is no. The patina, he says, "is one of the sacred cows." It also serves as a layer of protection against pollution—important 100 years ago, he adds, and more important today. And, he observes, the statue might not be recognized in a copper-yellow condition.

From this distance—we are on the catwalk, close enough to touch the statue—

seams show where the plates of copper overlap (they were formed by being set against a mold on the exterior and hammered upon the inside—a technique known as *repoussé*). A black substance has oozed from many of these seams and dried. This is a coal tar, applied from the inside to seal the interior from the marine environment and also to prevent the iron of the structural frame from grazing the copper and causing contamination. In excessive heat over the years, the tar leaked through and ran. It will be cleaned off with bicarbonate of soda, which cuts the tar but not the copper. "The copper's only 3/32nds of an inch thick—the thickness of a penny. We wouldn't want to take away from that," says Hoehl. The western side of the statue is blackened from acid rain and other pollutants. Hoehl rubs the discoloration vigorously; none of it smudges onto his hand. It will be cleaned as well, to return in time.

These maladies are not disastrous. The statue could have stood a long time with them. What *is* dangerous are the holes, from one to six at a spot, which have emerged as rivets popped on the inside. They indicate weakened or nonexistent support, and let moisture in, too. The most obvious appears on many of the pictorial reproductions—a pair of vampire-like dots under the chin, emphasized by the dribble of coal tar down the neck. Hoehl promises to explain the problem when we move inside.

We descend the elevator, getting off at the observation deck (the cornice near the top of the pedestal, identifiable by the single doorway), and enter the statue. We stand where the former elevator stopped, and visitors climbing to the top began their trek—up a squarish staircase, which then led to a helical one circling a pole near the center of the statue.

Interior scaffolding and working platforms, safety nets and materials of all sorts have disheveled the interior. The metal pylon and struts supporting the statue have been coated with a rust-inhibiting zinc paint. This part of the job has been the most pleasant surprise for Hoehl so far, and he enjoys telling why. Over time, the frame had been covered with paints of several bases—lead, oil, and even water; then for the Bicentennial in 1976, everything had been given a greenish color with a vinyl paint that amounted to what he calls "almost an armor coating." It more or less matched the copper oxide in color and protected the interior from pollutants, he explains, but it also trapped water behind it and promoted corrosion.

Hoehl anticipated spending months removing the paints, until it was discovered that liquid nitrogen would do the task in weeks. Hoehl points out that liquid nitrogen works cold—at -360°, an important detail because any sort of heat could damage the patina finish. Using it to remove paint on this scale, however, was new; the company that manufactures it—and donated it to the restoration project—had noticed that it stripped paint from anything it brushed. And it did not harm the copper (it did not even affect the coal tar). When the interior is reopened to visitors, the metal will look almost natural. And it will exist in a gentler environment. Previously, temperatures ranged from 100° in summer to 40° in winter; and carbon dioxide, introduced by the breathing of visitors and trapped inside, ate into the surfaces. After renovation, the interior will be kept stable by a temperature-control system. The interior side of any piece of replacement copper will be left to oxidize naturally. "It'll be interesting to see what kind of green it turns," says Hoehl.

Even in the disarray of renovation, you can see the technological achievement that supports Bartholdi's statue. Credit goes to Gustave Eiffel, known at the time as a bridge builder, who put his expertise to work on a vertical structure (and later the Eiffel Tower).

The statue's central tower is a girder that reaches deep into the pedestal and extends to the shoulder; tapered slightly, it is braced with diagonal bars for trussing (another trussed girder extends from this main piece to support the upraised arm). Attached to this framework is a series of single-angle bars that reach out toward the statue's interior skin. Both girders and bars are in excellent shape and need no rehabilitation other than cleaning and painting.

Connected to the single-angle bars are hundreds of ribs, or "flat bars," so-called because they are bent, if needed, only at the points of attachment. The farther ends of the ribs are connected to bars that actually touch the skin. These are "armature bars"—Hoehl likens them to a hoop skirt or bustle, shaping the exterior. Marvin Trachtenberg, an art historian at New York University who wrote a book on the statue after he was, as he says, "enticed" to take his children to visit it, calls the flat bars "the most ingenious and subtle aspect" of the arrangement. He points out that they serve, in effect, as springs. They keep the copper envelope elastic, letting it adjust to thermal expansion and contraction and resist the winds which strike the exterior surfaces unevenly.

Hoehl takes this moment to explain the reason for the holes in the statue. The flat bars are attached to the armature bars by rectangular pieces called "saddles," which fit over the joint; there are some 1,500 of them. The saddles are riveted top and bottom (the statue has some 25,000 rivets in all). Both saddles and rivets are copper; the bars are wrought iron (actually, "puddled" iron, so called because of the bath used to extract impurities from the metal). When they touch in humid situations, they spark electro-chemical reactions, and corrosion sets in. The original engineers knew of the problem—and so they coated the saddles with coal tar. But during a century of temperature extremes, the tar lost effectiveness, letting water seep behind the saddles. When it froze in cold weather, the saddles loosened and, in many cases, the rivets popped; the frozen water also caused minute bulges in the skin.

In what Hoehl calls "the most significant area of replacement," the armature bars, the saddles, and the rivets must all be made again and reinserted; so must many of the flat bars. The armature bars require skilled artisanship. For each one, workers take a template and mold while the bar is in place. Then, in the workshop that has been set up on the island, they make likenesses. The bars have not only hills and vales, like the enlargement of a back road traced from a map, but also twists in other directions, like banked curves. Some under the folds of the gown are nearly pretzels. Contact with the interior skin need not be continuously perfect, but they must conform to the shape more than approximately. The work is slow. "We're only able to replace a certain number at any one time," Hoehl points out, "because we don't want to create any weaknesses in the skeletal frame in taking them off."

After the armature bars are shaped, they are annealed. "Because of concern about what was happening to the molecules at the bends," says Hoehl, "we're putting them into an electric-resistance welding machine that will take these bars, an average of four or five feet long, hook onto them at either end, and heat them to a cherry red at an even temperature to get all of the molecules evenly distributed again. The annealing process will give back a lot of the strength it had when it was a flat bar. We will then blast it because, no matter how much you try, stainless steel picks up a lot of inclusions, or impurities, in the rolling process. Even the machines we're using to bend them introduces impurities we'll have to remove."

The flat bars connecting the armature

Like a bustle or hoop skirt, the statue's armature bars shape the exterior skin. Those bars, the saddles by which they are attached to the flat bars, or ribs, and the rivets which hold the saddles must all be replaced. Shaping the armature bars (left) goes slowly. A glance at the workers' plans shows the road map—with hills and vales and banked curves—the workers must follow. Bending the bars take away much of their strength, so the shaped bars are annealed—heated at an even temperature until the molecules are evenly distributed again.

bars to the major part of the pylon will be made of ferralium, which contains more iron than does steel and will, presumably, more resemble what they replace. Ferralium, says Hoehl, would have been used instead of stainless steel throughout. In being bent, however, it proved to "have a good memory—it would bend *back*," he says, so its use is being restricted to straight pieces and tie-backs and ribs that do not require bending. Copper was proposed, but it would have been too heavy—a consideration, Hoehl adds, that probably crossed Eiffel's mind.

Instead of coal tar, "we're going to take an editorial license with the improvements of the industry," as my guide puts it, "and wrap the joints with Teflon"—not so much to guard against corrosion as to give the statue more flexibility in the face of thermal changes and wind. And the new rivets will be patinated before being inserted so that the statue, from the outside, will not look as though it is dotted with pennies.

Hoehl admires Eiffel, who, he points out, constructed the equivalent of a modern-day skyscraper in making the statue's skeleton (100 years ago, the statue was the tallest structure in New York). Eiffel fitted it with what amounts to the "curtain-wall" system now used in many office buildings—a system of metal and glass, the metal flexible enough to absorb strains as it "follows the sun." "The statue was innovative, but nobody really realized what he had designed," says Hoehl, pointing out that Eiffel's development was not adopted for buildings until Pittsburgh's Gateway Center was put up some 30 years ago. "In spite of the fact that there are corrosion problems," he concludes, "the statue has held up remarkably well."

One reward he expects after the tedious process is completed is a renewed appreciation of Eiffel's engineering achievement. Workers have removed forever the wire-mesh cage enclosing the staircase; it had been slapped up in past years to keep overly energetic visitors from climbing over the bars. The protective plate that had served as a splash pan for leaks has been removed, as have platforms that created congestion on the stairs. Lighting will show off the system of construction. A hydraulic, stainless-steel, glass-enclosed elevator, double-decked and timed to rise not too quickly, will let tourists appreciate the interior at least as far as the stairs ascending into the head. "Most people, all they can think of is that damn walk up the stairs. It's a killer. And going down is almost as bad," says Hoehl, observing, "It's still going to be a tough walk."

Since all of this work will be perfectly visible in the finished structure, it has led to one of the renovation's continuing and inevitable controversies. Stainless steel, says Hoehl, is tougher to bend than wrought iron yet is more durable and ought to last longer. But using it amounts to *restoration* rather than *preservation*. The distinction arouses worry from some historical architects.

"Restoration, in many cases, applies to the application of new material, and preservation is an attempt to save what was there. Preservation has been the basic philosophy of this effort, to the degree that that's possible," says Gary Roth, curator at the National Park Service. The Hartwick College graduate is helping prepare a new "Statue Story Museum" and manages the various exhibit planning, design-fabrication, and installation contracts involved with it. "We're not trying to build a new statue," he adds. "We're trying to preserve the one that's there."

The most noticeable parts are the torch and flame. "You *are* removing parts of the statue," he acknowledges. "The question is, when you replace what you've removed, to what period do you replace it? Basically what we've done is to go back to the way the torch and the flame were originally structured rather than the way they were modified over time. But for preservationists, this leads to all kinds of mental torture."

Roth is referring to the reticulated flame and torch familiar to us. In its original form it was, like all of the statue, solid copper sheets. In 1916, however, John Gutzon Borglum, the sculptor who later carved the faces in Mount Rushmore, was commissioned to make openings so that the statue could be used as a lighthouse. Leaks between the glass and the metal resulting from the surgery, ironically, were the chief source of destructive water in the interior. And the intention of the cutting was never fulfilled; the statue failed as a safety device in the harbor and functioned as a lighthouse only symbolically.

The debate on which route to take for the rehabilitation is well known to F. Ross

Project chief George Hoehl (above) says that a hole was to have been cut in the statue's right sandal, as an entryway for workmen and materials. Rather than compromise the monument's original design, the plan was quickly scrapped.

Holland, Jr., a historian recently retired from the National Park Service who serves as director of restoration and preservation for the foundation. "In the beginning, when we first started talking about changing the thing back to the original, taking a little purer approach to it," he recalls, "there was some resistance—which I found rather interesting: People feel so strongly about the statue. They complained that the service was 'changing' the statue. But when we explained that we weren't changing, but going back to what it was originally, then they began to understand and the complaints subsided."

Paul Goldberger, architecture critic for *The New York Times*, points out that opponents of some restoration projects maintain that old monuments ought to look old, and not new. His own opinion is that such structures are not merely "pieces of nostalgia," but physical objects that require care and rehabilitation if they are going to exist at all. Skillful and sensitive rehabilitation, he says, "does not erase the sense of time—it buys more time."

Holland, in effect, uses this logic in observing that the park service will not compromise the integrity of Bartholdi's design or intentions. (He calls the carved flame "official vandalization.") Stainless steel, like puddled iron, is ferrous, he points out; the fact that the newer material will not violate the look of the interior, yet, in being compatible with copper, stainless steel overcomes the sole defect of the original metal. The original bars will be retained in the right front foot, so that visitors can sense the statue of 1886.

He also points out that the flame will be covered with gold leaf, in order to stand out both during the day and at night when a light placed on the outside gallery plays upon it. Purists may register a complaint about that as well, but they will lose again. Bartholdi, never satisfied with the lighting experiments after the statue was installed, recommended gilding.

Hoehl, who says that the debate is not one which his firm normally encounters, tells me that, under a previous plan, a hole was to have been cut in the statue's right sandal as an entryway for workmen and materials. It was scrapped quickly.

Hoehl and I resume our journey, taking the scaffolding elevator to the base of the pedestal. There are abysses where the elevator shaft and stairs had been. Peering down about 50 feet into the foundation, I see what Hoehl calls the "dunnage beams," horizontal bars on which the pylon of the statue actually rests. According to Hoehl, the pedestal, faced with granite, was the largest poured-concrete structure in the world at the time. It is made from Rosendale cement, the same that forms the pillars of the Brooklyn Bridge, totally unreinforced by steel but enormously strong. (It is too slow in curing to be used today.) I have heard that, to tip the statue over, you would have to tip the island as well. Hoehl agrees. He notes that tipping the island would be no easy matter. The island is not a piece of earth formed by currents, but a piece of the schist which underlies the buildings of Manhattan.

We walk outside the statue, passing

SELLING THE LADY

The Statue of Liberty might be the most exploited piece of Americana. Sometimes you cannot tell whether a certain use is a tribute or an absurdity.

Creator Bartholdi started it. He held a series of dinners in the statue—successively, in the kneecap, the stomach, and the head. In 1918, some 18,000 officers and enlisted men at Camp Dodge, in Iowa, formed a huge statue in its shape; most wore khaki, but others, tactically placed, wore white to form outlines of the body and gown.

In the opening scene in Kafka's *Amerika*, the hero sails past the statue, but he sees it holding a sword. A mistake by the author? Art historian Marvin Trachtenberg says no—Kafka portrays a "nightmare world." Literary scholar Martin Evans says yes: "He probably saw a bad photograph," and what is behind it, anyway, is "the threatening, castrating female."

The final scene of *Planet of the Apes* shows the statue destroyed, symbolizing the death, by nuclear destruction, of liberty and every other human virtue and vice. The final moments of *Up the Sandbox* show a group of American terrorists bungling their method but carrying out their intention of blowing up the statue. A poster depicting the statue pregnant advertised a 1973 review called "What's a Nice Country Like You Doing in a State Like This?"

The statue makes appearances world-wide. A billboard between Vicenza and Florence, in Italy, displays it in an advertisement for American-style clothes (whose brand name is another American symbol, Marlboro). The National Park Service's Gary Roth has posters from the Soviet Union showing the statue as a villainous creature. In their colonial days, the French reportedly transported a reduced version of the statue to Hanoi; I have not heard of its fate.

In the United States this year, it is everywhere. The cover of the January issue of *Mad* magazine paid homage to the renovation: A helicopter has hoisted a gigantic Q-tip to clean the statue's ear. There are advertisements galore for the restoration project. Some are sponsored by the foundation. Others are self-serving. A French perfume manufacturer sends regards to his "American friends" through his picture standing behind the quarter-sized Bartholdi original which stands in the Seine. You can buy the "official Statue of Liberty radio" or a magazine subscription and who knows what else, and the respective firms promise to pass part of their profit on to the foundation. Or you can send $10 and a nonreturnable photograph to a company which will insert the picture into some kind of electronic viewing device on Liberty Island.

Is this sacrilege?

"I think there is very little that any ad can do to the statue," says Roth. Still, all of that activity "makes a statement—it is so great a part of our national psyche that there are all kinds of opportunities for use. What one person thinks is a misuse, another person thinks is a great business opportunity."

—ML

The restored torch and flame will, like the original, be made of solid copper sheets. (The familiar lighthouse cut-outs came in 1916). The first step: building a full-sized plaster-of-Paris model.

piles of debris. The stairs are recognizable. Someone has a contract to haul it away—and will probably section it into pieces small enough to sell as souvenirs. We can see the boat at the visitors' pier. I think of the poem "To the Statue" by May Swenson, in which the passengers are said to be packed like "asparagus tips." Not today, however. Tourists assume they are not welcome; Hoehl says that business is off 60 percent. In fact, however, the foundation has gone to some pains to keep the island open, outside the workers' compound. A current attraction is the workshop where the armature bars are shaped and the new torch and flame are being made.

The workshop, which we enter, covers the area of a football field. One side has a glassed-off passageway, through which tourists can watch the workmen, both French and American.

The American half of the workers' side is conspicuous for the "Save Our Statue" stickers attached to lockers and walls. We pass a large press and drills, the large metal container that is the annealing machine, racks with finished bars, carefully labeled, and the banner "Ornamental and Architectural Ironworkers Local 580." The union had to come to an accommodation with the French, says Hoehl, since its representatives felt that the French were taking their jobs; for a while, it was "save *our* statue." But the *repoussé* technique is not often used, and its practitioners are few. "There's no way they had the expertise to do what these guys are doing. They could have learned it," he continues, "but, with all things considered, we don't have forever to do this."

The French side contains iron "lasts" embedded in sections of tree trunks and rows of both metal-headed hammers and wooden mallets. When I visit, the workers are plotting points on a full-sized plaster-of-Paris model of the flame; smaller maquettes lie nearby. The designs of the original were destroyed in a fire at Gaget, Gauthier et Cie, the firm which produced the statue, so they have designed it anew from period sketches and photographs.

According to Jean Wiest, assistant project chief of the French workers, *repoussé* requires understanding copper, a sense for volume, and talent in drawing. The technique was "almost dead," he says until Serge Pascal, the project chief, revitalized it by studying books, learning from old craftsmen, and teaching others. He and his colleagues came in November and expect to be finished by the end of the year. They are accustomed to traveling wherever there is work within their country, making what they call the *"tour de France"*. "It is not the same, like to do other metalwork in France, because it is the Statue of *Liberté,"* Wiest says, his voice obviously not translating *Liberty* out of his native language. "It is different. It is special."

We stop in the corner to inspect the old torch. Corrosion is evident, as if myriads of bugs have gnawed at the edges of the copper. Bartholdi went to great trouble for tiny details. The railing design contains corn husks about the size of a finger; not many have seen *them*.

Darkness has begun to fall when we leave. Mist has its own fetchingness; the lighting on the scaffold turns the pipes into a spectacle all their own. Hoehl tells me that dramatic lighting is planned for the completed statue. Subdued at the level of the fort, it will increase in intensity as it rises, culminating at the flame.

In its state of rehabilitation, the statue looks of a piece, with only worklights playing off the scaffold. According to Hoehl, the lighting designer proposed placing lights inside the scaffold in order to illuminate the statue better and diminish the impact of its temporary surroundings. The foundation and the National Park Service, however, chose the current arrangement, he says, observing, "They wanted people to know what is going on out here."

Copper is not the only patina encrusting the statue. Symbolism does, too. And that deserves some brushing off as well. Gary Roth expects to include the symbolism in the Statue Story Museum. His own experience tells him it is needed. "I never went to the statue until I left New York," he says (he is currently located in West Virginia). "I never thought seriously about it. It was something you just took for granted—an oddity out there, bizarre, this huge monstrous thing."

Although the new museum will display the symbolism, he warns that "it's going to be a lot of questions posed without answers." And he adds, "I'm not sure there *are* many answers, because it has a lot to do with what your own thinking is."

For starters, there is the idea in the

minds of the French who conceived of the gift. The statue represented a hope of liberty for *them* and had little to do with the United States except strategic convenience.

The guiding light was Edouard-René Lefebvre de Laboulaye, a jurist and Alexis de Tocqueville's successor as the French authority on American constitutional history. Marvin Trachtenberg describes a convoluted piece of history as clearly as anyone: France since 1789 had vacillated between monarchism and republicanism.

Laboulaye was a republican; he had made order and liberty a motif of his three-volume history of the United States. Talk about the statue began in his circle in 1865, when the republicans were political outsiders. Since an object representing moral and political virtue was to be constructed by the opposition, a distant yet relevant location seemed appropriate. (After Lincoln's assassination, French republicans presented a memorial medal to his widow. It was struck in Switzerland and smuggled into the American embassy in France to escape the agents of Napoleon III. Trachtenberg suggests this exploit as a precedent for the statue.)

The expressed reason for the gift was that it signified "a genuine flow of sympathy" (as Bartholdi put it) between peoples, dating back to French help during the American Revolution. Trachtenberg calls this rationale a useful myth that promoted good feelings. But he points out that the donors' own sense was that it beamed its message to Europe, which it faced. The message was incorporated in the statue's full title: Liberty Enlightening the World.

John Higham, professor of history at Johns Hopkins University, adds that the real motive influenced the statue's physiognomy: "a passive figure, austere and stern-visaged, a model of frozen perfection."

Today, the French hint at another symbolic layer, telling an old-fashioned story of obsessive love. It appears in the biography of Bartholdi in the brochure you can buy in Colmar, the Alsatian town where he was born. It centers around Jeanne Emilie Baheux, his model for the statue's arm and torso. After he discovers her, they live together without telling Madame Bartholdi, unable to marry because of the "willful, tyrannic, exclusive passion" of his mother for him. There are comic episodes of deluding the mother when she visits her son in Paris. In 1876, Bartholdi heads the commission presenting the right arm and torch to the United States for its centennial celebration in Philadelphia. He wants to take Jeanne (they expect to be married in the United States), but cannot escape the company of the other delegates. He manages to obtain a Canadian passport for her, and she travels on the same ship anonymously. They are married before they return to France. Thus liberated, "Bartholdi can devote himself entirely to 'Liberty'."

Bartholdi is said to have been thinking of his mother when he shaped the face. It is supposedly a political tribute, since she was a virtual prisoner after Germany had annexed Alsace-Lorraine in 1871. Knowing about Jeanne, a Freudian might read guilt into the sculpture's gesture and cast another interpretation on that stern-visaged model of frozen perfection.

National Park Service: Statue of Liberty National Monument

On opening day, the masses who had helped pay for the statue's pedestal were present only in the speakers' rhetoric. The big shots, most of whom had withheld their support, were invited to sail into the harbor to view the fireworks.

The United States, at the time, had myths of its own, and the statue matched many of them neatly.

One of the strongest myths, surely, was "manifest destiny," an expresssion of national confidence and power dating from the 1840s. It was "a body of sentiment and nothing else," according to Norman A. Graebner, professor of history at the University of Virgina. But it was a sentiment that contained all of the elements that would later be affixed to the statue.

"Manifest destiny" justified expansionism, and what was territorial at first became political as well. "The emancipation of the whole race" was "dependent, in a great degree, on the United States," said a newspaper editorial in 1845 (slavery often was conveniently overlooked). The idea allowed for foreign assimilation, although it would take nearly half a century after the statue was erected for the idea to be ascribed to it. "Long may our country prove itself the asylum of the oppressed," said a congressman in 1845. And a British traveler, shortly thereafter, presciently anticipated the French gift by writing in fear that Americans "only wait for material power to apply the incendiary torch of republicanism to the nations of Europe."

Openness is another important American idea, as described by J. Martin Evans in *America: The View From Europe.* Openness was, first, geographical and quickly became an attitude: not only that one's intentions be open and above-board, but also that every part of life be open to scrutiny.

Openness may have translated into a reverence for the big, the concrete, and the measurable. In 1898, the British journalist George W. Steevens called Americans "the most materialistic people of the world"—not in the sense of being avaricious, but "in the sense that they must put all their ideas in material form." The notion was extended by George Santayana, who wrote of the American, "To my mind, the most striking expression of his materialism is his singular preoccupation with quantity. If, for instance, you visit the Niagara Falls, you may expect to hear how many cubic feet or metric tons of water are precipitated per second over the cataract."

And so, among the figures you have heard and will be hearing are the height of the statue from base to torch (151 feet, 1 inch), the length and width of a fingernail (13 and 10 inches), the extent of the nose (4 feet, 6 inches), and the weight of the copper sheets (100 tons).

In a sense, then, the statue fit right in. It existed in the minds of Americans before they received it, and it came to an appropriate home, even if the expressed motives for giving it had been somewhat contrived.

To see how it was impressed upon Americans, however, we must turn to opening-day ceremonies, on October 28, 1885. In that celebration, eminent personages tried to establish the symbolic meaning of the monumental work.

The Rev. Richard S. Storrs swallowed the French line, speaking of the "remembrance" of mutual friendship and the "promise" of extending peace over a tumultuous world.

Count Ferdinand de Lesseps, president of the French-American committee after the death of Laboulaye, praised "individual initiative" and American "go-ahead" (he received applause for that) and declared that "progress is religion." He anticipated the theme of economic opportunity that would be associated with the statue.

President Grover Cleveland observed conventionally that the statue would "pierce the darkness of ignorance and man's oppression," but added the new and forbidding warning that it would be "our own deity keeping watch and ward before the open gates."

W. A. LeFaivre, representing France, praised a century of American dedication to liberty, saying, "The republics of the past were debased by hostility to foreigners, by arbitrary and brutal power, and by slavery." He apparently forgot how recently his host country had stopped debasing itself by slavery; and he ignored or was unaware of recent bombs, strikes, and laws, which were, in those very years, making Americans fearful of immigrants—a strain predating the 1880s and one that has not been quelled.

In the major address, the Hon. Chauncey M. Depew suggested that, with the backing of the Bill of Rights, "the problems of labor and capital, regeneration and moral growth, of property and poverty, will work themselves out under the benign influence of enlightened lawmaking and law-abiding liberty." Alone among the speakers, he hinted at what would become the chief association: "The rays from this beacon, lighting this gateway to the continent, will welcome the poor and the persecuted with the hope and promise of homes and citizenship."

It is, no doubt, too easy to see the defects in the optimism of that drizzly day. The orators reaffirmed a history they but poorly interpreted. They insisted on a social unity among Americans that did not exist, and an identity of interests that contradicted the very idea of individualism they also espoused. They spoke of a commonality of economic classes that was violated in the ceremonies themselves; Trachtenberg points out that the masses who helped pay for the pedestal (the American contribution to the structure) viewed the proceedings from afar, while the big shots who, for the most part, had withheld their resources were invited to sail their boats into the harbor and watch the fireworks.

The meanings expressed that day were too many, and too discrepant, for one object to represent. Yet it is the fate of the statue to bear them all, various ones being emphasized at different times.

To taste the flavor of the changes in meaning, let us follow the argument of John Higham. His ideas will influence later thought because he has been retained as a consultant for the firm putting together the Statue Story Museum.

The French rationale for the gift, he says, varied from the American idea of it as early as 1876, with the appearance of the arm and torch at the Philadelphia cen-

tennial, because the statue became firmly linked with American independence. Many decades passed before it was looked on as a symbol of welcome.

Higham points out that, despite an occasional allusion to the statue as beckoner in the 19th century (like Depew's), "the perception remained inert; it lacked any mythic power." The most significant early statement of that sort was the sonnet by Emma Lazarus ("Give me your tired, your poor, / Your huddled masses yearning to breathe free, / The wretched refuse of your teeming shore," etc.). Written in 1883 for an auction raising funds for the pedestal, it was motivated by her revulsion at pogroms of Jews in Russia and her own newly awakened Jewish identity. But the poem was not mentioned at the dedication. It was affixed to the statue only in 1903, without fanfare, long after Lazarus had died, and even then attracted no notice.

Meanwhile, Higham continues, immigrants who entered at New York—the vast majority did—were moved by the statue. But there was little public sense that it represented an asylum of safety and opportunity. In 1936, speaking at the 50th anniversary of the statue, President Franklin D. Roosevelt passed over that association with only a solitary reference.

In the late 1930s, that idea grew. Higham attributes the different outlook to a turn of American opinion against racism, which "coincided" with the plight of Jews escaping Nazism. And there was a third element—a publicist. That was Louis Adamic, a writer who had immigrated from Yugoslavia and who quoted Lazarus in virtually every article he wrote and every speech he made. And he prevailed. Higham observes that the statue, seen as defending the shores during the great flood of immigration ending with restrictive laws in 1924, was viewed as a symbol of welcome only when the gates were all but shut.

Subsequently, the statue's softening influence also prevailed, Higham concludes. Mass immigration, he argues, had opened rifts in American society that the statue, in its new meaning, helped close—culminating in its influence upon 1965 legislation to relax the immigration laws.

The statue's meaning has undergone changes because the United States speaks in multiple voices. So, at least, Garry Wills, the political commentator, suggests. He points out that Thomas Jefferson, in *Notes on the State of Virginia*, wanted to limit immigration, in an early demonstration of nativism. Yet, Wills, who serves as professor of American culture and public policy at Northwestern University, says, "our sense of ourselves is that we're a welcoming people, without those prejudices."

And the irony continues. Just when the statue is being refurbished, immigrant groups from South Asia and Central and South America are being turned away. "Our immigration rules and our general rules for admittance have always been rather strange," Wills says. "There's been a constant tension in our history between wanting to keep ourselves a separate people, pure, unentangled with the mass, and wanting to have influence over the world, which, obviously, means being open to the world." Should, then, Americans look upon themselves as hypocrites? "I don't know about that. We're not perfect," he replies. "We're not one personality. America is a lot of people doing a lot of different things, saying a lot of different things which are contradictory—but which are not hypocritical because they are different people doing the voicing."

Immigrants can still have the primal statue experience. It happened to the Welsh Martin Evans and his Swiss wife when they left England for one of the basic reasons associated with the statue, economic opportunity—in his case, a teaching post at Stanford University, where he is a professor of English. "We were, by no means, the wretched and the oppressed," he allows. "We passed the statue—it's a very moving experience. We both wept when we passed it. There it was, in the dawn, and it was an extraordinarily moving sight." His disembarking was mythical, too. "We were made to feel at home by, believe it or not, immigration officials. I was greeted by one who said, 'Welcome to the United States, prof.' Well, nobody had ever called me 'prof' in my life before, and certainly no immigration official in Europe would ever think of uttering the word 'welcome'."

Evans acknowledges, however, that the statue has "lost a certain amount of its symbolic significance" because "the immigrations are occurring behind her back—she's facing the wrong way."

Philip Young feels that Lazarus's words are so strongly tied to the statue that they have kept it alive as a symbol—which may be its undoing as a cultural factor. "It's almost reversed itself—not, it seems to me, through any hostility or inhospitality on our part, but the fact that there's a limit to the numbers of people we can absorb," he says. "In other words, immigration has become a problem rather than an opportunity."

Today, he continues, the statue is chiefly symbolic "of how we got where we are. It reminds us of the past." He compares it to a bust of George Washington. "To me, it's a kind of pious—in the best sense—a gesture of piety, to remember that once we were all immigrants."

Dean MacCannell, an anthropologist writing a book on American "mythologies," says that he is tempted to view the internal "crumbling" as symbolic in itself. Not that the country is corrupt, he explains, but that Europe is not the source of new blood. "But I don't think it's so much that the borders are closing down. From the West Coast standpoint"—he teaches at the University of California at Davis—"the borders are wide open. There is a visible new minority arriving constantly.

"This restoration almost seems to be a capstone on a former type of migration," he continues, "the end and the rendering historical, basically, of the European migrations—and the transformation of that statue into a historical monument rather than a living, 'crumbling' device. It's as if we are acknowledging the history by restoring the statue."

McCannell has an approving view of tourists (he explained it in his book *The Tourist*), which he applies to the statue. To him, tourists are not the superficial gleaners of experience as they are conventionally derided. Instead, they "attempt to discover or reconstruct a cultural heritage or a social identity."

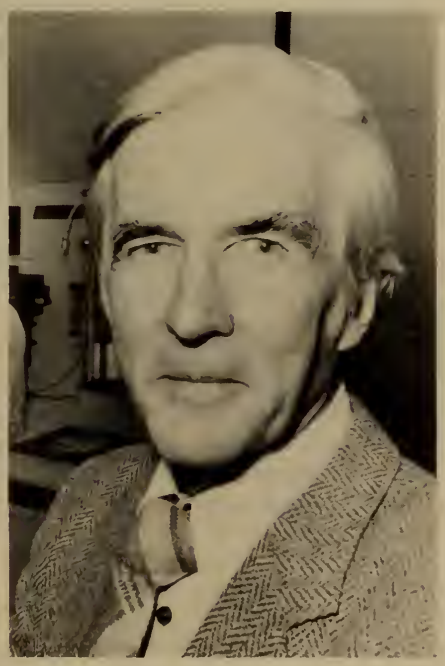
Gradually, a monument like the statue undergoes "site sacrilization." As a national symbol, "it partakes of the sacred in a strict and literal sense," he says. "And that presents us with an enormous double bind: We're not supposed to fiddle around with things that are sacred. On the other hand, we're not supposed to let them fall apart, either."

That dilemma helps assure that the restoration and preservation will be done as authentically as possible, McCannell indicates. The rehabilitation, if sensitively carried out, will enhance the quality of the visit; and that, in turn, will heighten the "total and unmotivated awe," the feeling akin to a religious experience, that visitors have. The quasi-religious experience at the statue is enriched, he continues, by the fact that "it has its value stamped on it, like a coin: liberty."

Marshall Ledger is associate editor of another American institution, The Pennsylvania Gazette, *the University of Pennsylvania's alumni magazine.*

The address given at Fall Commencement, October 8, 1984, by Dr. Wilmer L. Kranich, Dean of Graduate Studies and Gordon Professor of Chemical Engineering.

Looking Ahead By Looking Back



Editor's Note: *Dr. Kranich retires at the end of June. Thirty-seven graduating classes have passed through WPI during his tenure on the Hill.*

He retires at a time when post-graduate education at WPI is becoming a more vital element of the Institute than ever before. He leaves a foundation of excellence in teaching and leadership on which the next generation of graduate education will surely be built.

"As you are now, so once was I
As I am now, so shall you be."

These lines are a rather strange introduction to a commencement address, particularly when you realize that they are the two middle lines of a verse frequently seen on tombstones in the cemeteries of Colonial America. The occupant of the grave solemnly reminds us that we will follow all too soon beneath the sod.

My use of this little verse is far more cheerful. I use it in my year of retirement to remind myself and you that I once had your place in similar ceremonies, and that in due course you shall have mine.

Forty-four years ago I sat at my commencement at the University of Pennsylvania listening to President Roosevelt address my class. (That was Franklin D. Roosevelt, not Theodore!) Forty-odd years from now you can expect to retire, unless by then the means of prolonging life and canceling or slowing the aging process have been discovered.

What can you look forward to in the approaching decades? We can envision some ideas of at least the magnitude of the expected changes by looking back at the changes that have occurred in my professional lifetime.

Let's begin with one of the less important matters: the value of money. When I was in your place, postage for a first-class letter was two cents. The same amount bought the daily newspaper. The starting salary of my fellow graduating engineers was about $1,800 per year.

If you scale up these figures with the same inflation as has occurred between then and now and look ahead to your retirement year, mailing a letter or buying a newspaper will cost $3.00 (if indeed anyone still mails letters or reads newspapers), and the starting salary of the new graduate engineer will be $350,000 (if there still is such a designation).

But my main interest today is not in talking about money, important as that may be in determining our life styles. I really want to look at technological change. There is no way to use my experience to predict what science and technology will be like in the 2020s when you can expect to retire. But you can use my experience to suggest the magnitude of the changes you are likely to encounter.

Probably the greatest differences between 1940 and now are in the ways we handle information and make calculations. My college calculator was the slide rule. You probably don't even know how to use one—or care to, for that matter.

In my first years at WPI, the head of the Physics Department, Dr. Morton Masius, would astound freshmen students by performing complicated mental multiplications and divisions. His tool was a three-place table of logarithms which he had memorized. I doubt that many of you have ever even used a log table, much less memorized one.

When I was at Pennsylvania as an undergraduate, there was in the basement of the electrical engineering building a vast mechanical array of cams and gears: the mechanical differential analyzer. A short time later in that same room, the first major digital electronic computer, the ENIAC, was developed. This was a marvel of thousands of vacuum tubes whose computing power was but a fraction of that of my current pocket calculator, and whose electrical energy requirement was millions of times that of my transistorized calculator, whose power comes from the light of the room. There was no television

monitor with which to communicate, and of course nothing in my undergraduate curriculum to hint at programming languages like Fortran and Pascal.

Information was found in books and journals tucked away in the stacks of a library, and systematic ways of retrieving data from a variety of sources reached their highest degree of sophistication in journals like *Chemical Abstracts*.

In the short span of my professional lifetime I have had to cope with a huge array of computing devices which have advanced at breakneck speed, with new programming languages and vast banks of information accessible at the touch of a keyboard.

Can you expect an information revolution of a similar magnitude? Will there be direct communication between the brain of man and the artificial intelligence of a computer? Will your thought processes be controlled electronically from an external source? Will libraries as we know them disappear? Will printed journals and books be only a matter of history? Or, as is more likely, will the changes be far different and perhaps even greater than those we are contemplating here?

The key point for you as new graduates is not so much that changes will occur, but that you *will* be able to deal with them just as my generation has been able to. My college education did not give me the facts and tools needed for a professional lifetime, but it did give me the means and attitudes and approaches to meet those challenges through continuing work and study. Your education will do the same if you do not regard it as a program which has ended, but as a process which has just begun. "Education for lifetime learning" and "learning to learn" are not just catch phrases from college recruiting publications. They are our challenge as teachers and yours as students, now and for the future.

But, of course, the value of money and the handling of information and calculations are not the only major changes which have come about within my memory. My first flight to Europe took 13 ½ hours in the air and required refueling stops in Gander, Newfoundland, and Shannon, Ireland. The speed of sound in air was regarded as the upper theoretical limit for aircraft. Breaking the "sound barrier" was an awesome challenge and achievement.

Robert Goddard '08 was looked on as a dreamer when he wrote about the means of escape from the earth's gravitational field and the possibility of a flight to the moon. Can you look forward to transportation changes of an equal magnitude? Vacations on the moon? Colonization of another planet? Even the speed of light may prove to be as transitory a theoretical limit to

A Veteran for the Cause

Dr. Wilmer Kranich arrived on the WPI campus in 1948 as an associate professor of chemical engineering. His credentials were impressive—a B.S. from the University of Pennsylvania, a doctorate from Cornell University, World War II service as a Naval officer engaged in rocket research, and a two-year stint as an assistant professor at Princeton University.

He and WPI were obviously a good match. A year later, he was appointed a full professor at the age of 29, the youngest ever to attain the rank at WPI.

Think for a moment about the WPI of 1948, when Wil Kranich began his lifelong career: a student body of 895, of whom 35 were graduate students; no evening graduate program. The Washburn Shops were still operating as a commercial business. What today is the Project Center was a working foundry. Sanford Riley was the only dormitory.

Certainly, WPI was different from the campuses Wil Kranich had known before coming to Worcester. And the Institute today is far more than the "Worcester Tech" that greeted him 37 years ago. Helping to make these changes has been the challenge Wil Kranich eagerly accepted during nearly four decades.

Throughout his long career at WPI, he has strived for excellence in teaching and opportunities for students. In his 17 years as department head, the Department of Chemical Engineering grew in size and worldwide recognition for its research in such areas as molecular sieve zeolites. He played a key role in the design of Goddard Hall, which replaced Salisbury Laboratories as the home of Chemical Engineering and Chemistry in 1965.

Wil was appointed the first George C. Gordon Professor of Chemical Engineering. During the development of the WPI Plan, he strongly supported increased opportunities for academic excellence in all departments.

Since 1974, he has held the dual posts of professor of chemical engineering and dean of graduate studies. In the former role, he has been able to devote more time to the research he loves. He has authored more than 30 professional papers, the most recent of which involves the hydrogenation of acetylene using palladium zeolite catalysts. This work was done during a sabbatical leave at the Hungarian Academy of Sciences in Budapest in 1983.

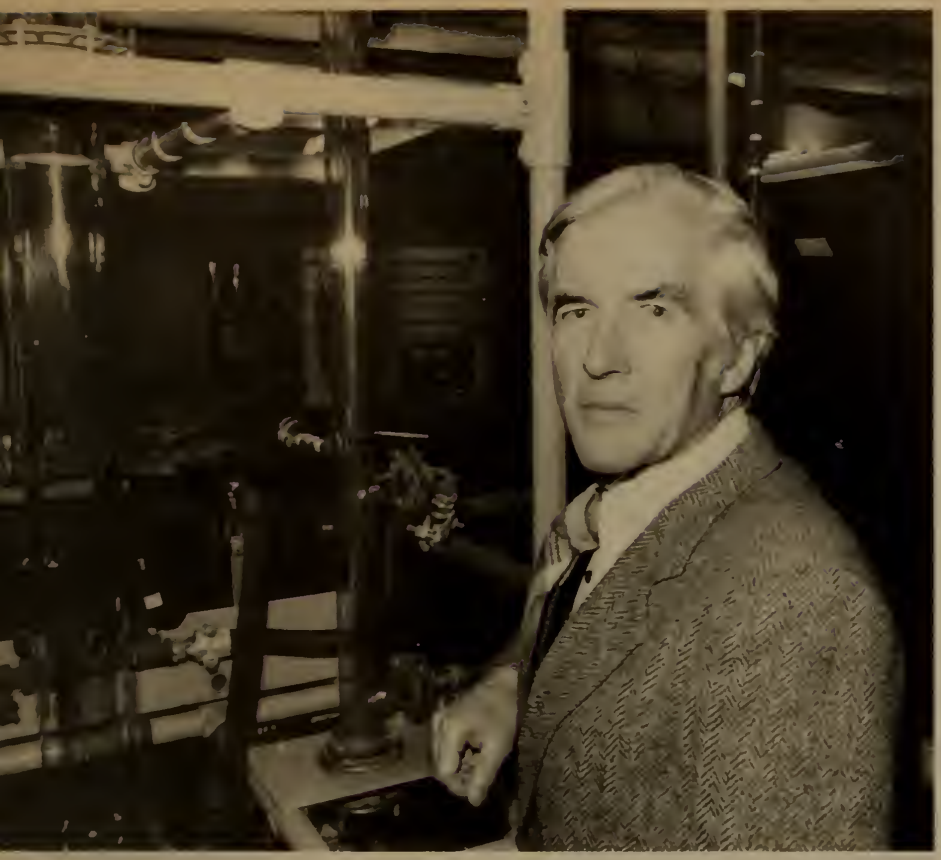
During his tenure as dean, graduate education has expanded to include doctoral programs in biomedical science, computer science, materials engineering and interdisciplinary studies. Master's programs have been added in fire protection engineering, biology, biotechnology, construction management and business administration.

In addition to his devotion to his profession, Wil is well known for his outside interests. "Have black tie, will sing" could describe his interest in choral singing. He has been for many years a member of the Worcester Chorus, which participates in the annual Worcester Music Festival and the Christmas season performance of the "The Messiah."

Another interest, art, he shares with Margaret, his wife of 35 years. With their daughter, Deborah, the Kranichs will display their work in the gallery of the Gordon Library from May 3 to June 28, 1985. Margaret will show a selection of portraits. Deborah's specialty is abstract and semi-abstract.

Wil describes what he'll show this way, "Originally I used to call this 'junk sculpture,' but now that I've become better at it, I call it 'constructions with found materials.' " Former students and friends of the Kranichs are invited to a Reunion Day brunch honoring them on June 1. It will be in Goddard Hall from 8:30 to 10:00 am.

Roger N. Perry, Jr. '45



Dean Wilmer Kranich in the Unit Operations Laboratory, built during his tenure as Chemical Engineering Department head, 1967–75. From 1958 until 1967, he also headed the combined departments of Chemical Engineering and Chemistry.

your generation as the speed of sound once was to mine.

What has happened in communications during my lifetime? The first radio that I can remember as a child was the "superheterodyne" (whatever that might mean) that my father tuned with the aid of three big black dials, and which produced sound out of a horn that looked like a miniature tuba. Messages to Europe went by way of the transatlantic cable.

Then came communication by shortwave radio and the miracle of television, followed by satellite communication. Now we send spacecraft and coded messages into outer space and listen for responses from intelligent beings elsewhere. Perhaps in your time you may hear a response or even be visited by a real-life Extra Terrestrial.

The discovery of the double helix and partial resolution of gene coding have been a part of the experience of my generation. Gene splicing is with us now; what miracles will biology and biotechnology bring in your professional lifetime?

During the second world war, the Navy assigned me to work on rockets and guided missiles. In the office area next to ours at Caltech, secret work was going on which I later learned was the development of the shaped-charge explosive device which made it possible to reach a critical mass of uranium quickly enough to produce an explosive nuclear fission—the atom bomb. Where will nuclear physics and engineering lead your generation?

These examples of genetic engineering and nuclear engineering bring me to my second major point regarding your education. It is reasonable, though not commendable, to say that, when I was in your place, technical responsibility was kept rather separate from social responsibility. The engineer was responsible for the process. Someone else was responsible for the applications and their consequences or side effects.

In my first summer job during college, I ate my lunch sitting on the banks of Frankford Creek in Philadelphia. Some days the creek ran bright yellow, other days red or green, as the dye manufacturing plant upstream discharged its off-quality wastes. It didn't matter. The colored stream would ultimately find its way into the ocean where time and air and sunlight would purify it all.

On another summer job we were instructed to get rid of the spent catalyst dusts from our petroleum cracking unit by increasing the gas velocity and blowing out the dust—at night, when the plume of white smoke would not be seen and thus not needlessly upset the neighbors, but would be dispersed harmlessly into the infinite sky.

Still another summer job in a chemical plant resulted in symptoms of a severe head cold in the workers because of the large excess of hydrochloric acid fume which was vented to the *interior* of our building. Supposedly, we were told, the problem was solved by opening ammonia bottles. The ammonia fumes indeed neutralized the acid, but filled the air with the dense white smoke of ammonium chloride, so that we could not see from one end of the room to the other.

You will not be allowed to treat social and environmental problems in these naïve and short-sighted ways. You have learned that the problems of engineering cannot be solved without taking into account effects on health, on the environment, on society. You will have to help make difficult decisions about the limits of genetic engineering, about the consequences of advances in nuclear science and engineering, about how lasers may and may not be applied, about allowable side effects of pesticides and other chemical poisons, and about great and terrible discoveries still to be made.

You will be required more and more to evaluate the interrelations of science, technology and society. For those decisions your education (in particular your undergraduate Interactive Qualifying Project) has better prepared you than the less pragmatic education I received. But you must always be aware of the consequences of the materials and devices and products you may create or use.

So far I have made two points—first, that you will, before very long, experience tremendous technological changes and need to respond effectively to those changes; and second, that you are indeed obligated to share responsibility for

In his Boynton Hall Office, overlooking Alden Memorial to the west and Stratton Hall and the Washburn Shops to the north, Wil Kranich is at home with several found-object pieces of sculpture he has constructed, such as the untitled work shown here. His sculpture, along with the artistic works of his wife, Margaret, and daughter, Deborah, appear in an exhibition in Gordon Library, May 3 through June 28.

the societal consequences of advances in technology. My wife tells me that a good sermon should contain no more than three points. Since these remarks have turned into something like a sermon, I shall make only one further, and relatively brief, point before closing.

This has to do with changes in the meaning and conditions of work—changes which I have experienced and which you can expect to find. Long before I entered professional life, the abuses of child labor and the sweat shop had declined. But assembly line production was in its ascendancy, with its stifling effects on pride of workmanship. Individuality of the worker was submerged in collective bargaining, and the size of the paycheck replaced the challenges of the job as the principal incentive for many workers.

These effects spread to many professionals. The employer became the adversary. The so-called Puritan Ethic of working hard to get the job done in the best possible way diminished severely. This change was also noted in the attitude of students. For many the objective became getting the degree with minimum effort—even in scientific and technical programs. It became less common to see lights burning late at night or on weekends in the laboratories of graduate students or, it must be admitted, in the offices of the faculty.

Time for recreation became as important as time for work. Many would argue that this is good for the whole person, and I can see the value of that argument. But the standard of living of the nation and of the world will be raised only as worker productivity increases.

As more and more routine work in the process plant, on the assembly line, and in the office is turned over to automated controls, robots and computer programs, you will probably see a considerable shortening of the work week. You will also see a corresponding reduction in the efforts of many professionals. But I hope you will view the reduction in routine tasks as a challenge to spend greater effort on creative activities for which your education has prepared you.

Increased productivity can result from fewer working hours only when new ideas are pumped into the system by creative people—you! If you succumb to a work ethic which allows you just to get by with what is needed to accomplish narrowly defined assigned tasks, there will be little progress toward a goal of world improvement.

"As you are now, so once was I. As I am now, so shall you be." I invite you to fully meet the challenges and enjoy the opportunities of the four-decade journey that lies ahead.

Student Alumni Society members are busy keeping WPI traditions alive— and creating some new ones of their own, while they are

GETTING A HEADSTART ON ALUMNISHIP

By Kirsten Storm '85

Maureen McCaffrey '86 of Hopkinton, MA, was one of 15 students—all members of the Student Alumni Society—to grace Alden Memorial with the latest fashions.

The lights dim; soft rock music fills the hall. Soon, three models—two young women and a man—stroll out from behind the stage curtain to an expectant audience. They continue out on a raised runway. You'd swear they were professional models. The looks are right, the moves rehearsed, the fashions straight out of New York, Paris and Milan.

Seventh Avenue in New York? Far from it.

The scene is in Alden Memorial. The occasion is the first annual Dress for Success fashion show, sponsored by the WPI Student Alumni Society (SAS). The models are all WPI students—and SAS members—most of whom had never even *considered* strutting the latest in on-the-job wardrobes in front of their friends and classmates, all eager to catch up on what's "in" in clothing for young professionals.

SAS is one of the most active and fastest-growing groups on campus, a link between the activities of the current student body and WPI alumni—and the future of the WPI Alumni Association.

SAS was revived in the 1982–83 school year by a dozen or so students. Among other things, they wanted to restore the Alden Tower carillon, a fixture in the memories of many alumni, but an antique that had sat silent for several years. But this was just the beginning.

Since then, SAS members have distributed "Good Stuff Boxes," containing toiletries and such, to incoming freshmen. At Homecoming, members organize the parade of floats and serve in other voluntary roles, as they do on Parents Day in the fall. In April, they conduct a program called "Managing Your Salary," bringing in experts in fields such as banking, real estate, securities, taxes and legal issues to advise students who will soon enter the professional job market.

And in April, WPI Traditions Day, a cookout designed to acquaint alumni and students with each other and with WPI traditions, was held this year at the Higgins House.

Junior Jeanne Benjamin, of Chicopee, MA, headed the Dress for Success event. Juniors and seniors, mostly, filled Alden, since they are the students most concerned about summer jobs and interviews. In all,

"There seems to be genuine interest among students in getting involved with SAS."
—Diana Sauer '86

15 models, recruited from the SAS membership, made the evening something out of the ordinary at WPI.

"The main reason we used student models instead of professionals," explains Jeanne, "was to attract other students, who we knew would come to see someone they know modeling. This is a practical event," she adds. "Nearly half the student body is currently going through the interviewing process."

Reflecting on the event, Jeanne admits that she could never have predicted the work that she ended up having to put into it. She began the process last fall, she says, and worked right through the winter. "But I learned so much about managing people and organizing an event. It was a great experience for me."

In addition to arranging with La Femmina modeling school to train the student models and Jordan Marsh to loan the fashions, Jeanne also persuaded local businesses to donate door prizes. Students who attended agreed that the "show" was a big hit. As for the models, they seemed to enjoy themselves as well.

One model, Barbara Parady '86, of Stafford Springs, CT, says, "At first, I was very nervous, but then I saw friends in the audience, and I just relaxed and smiled naturally."

The Student Alumni Society was actually founded in the early 1970s, but because of lack of interest more recently, the SAS had become dormant. In 1982, Deborah Scott, then Assistant Director of Alumni Programs, approached a junior, Katherine Kruczek '84, for help in reviving the Society. Kathy was at that time working on restoring the old carillon in Alden and revising the *Tech Bible*, a pocket volume known to all freshman until it ceased publication in the late '60s.

Together with Patricia Flaherty '75, Kathy and Deb drew up the by-laws of the club. They also convinced the WPI Alumni Association to allow student representation on the Executive Committee.

"This," says Kathy, "was our first big step. It was the first time that students had

Roger Perry '45

ever been represented on the board of the Association." Thus was SAS born, with Kathy acting as the first chairperson, Deb Scott as the Alumni Office Advisor and Pat Flaherty as the Alumni Advisor.

Soon, a committee of 12 to 15 students was organized, most of whom were seniors at the time, to work on the *Tech Bible*, which was printed in the summer of 1983 and distributed to both freshmen and upperclassmen in the fall.

Meanwhile, Kathy, with the help of other SAS members, Dean of Students Bernie Brown, and Stephen Hebert '66, Director of Development and Alumni Relations, worked on restoring the old carillon. But, alas, it couldn't be repaired effectively. So with financial support from the Class of 1944, a new electronic carillon was installed in May 1984.

Today, junior Diana Sauer, of Millbury, MA, serves as SAS chairperson. Under her direction, the club held its first campus-wide recruitment this past year.

"The response was overwhelming," says Diana. "No fewer than 115 people have signed on, and at least that many more wrote in to express interest."

At that point, members decided that a more organized structure was necessary, so the club was divided into several standing committees, each headed by an involved, long-standing SAS member.

These groups' organizational strategies are enabling SAS to accomplish more and bigger events. This past Christmas, for example, SAS held a party at the Goat's Head Pub for students and administration.

How does WPI's SAS stack up against other schools' programs? Anne Marie Angelico, Director of Alumni Programs and current SAS Alumni Office Advisor, is pleased—to say the least. "I recently got a chance," she says, "to see how other local colleges are doing, since their student-alumni clubs started about the same time ours did. WPI's is much larger and more active than any others that began at the same time."

She claims that working with SAS members is "one of the highlights of my job." And, she adds, "The Alumni Executive Committee and Council have taken on a new dimension with the presence of SAS members.

Kathy Kruczek, now Kathy Vignaly, thanks to her marriage in 1984 to Joseph Vignaly '82, shares Ann Marie's zeal for the club. She is currently serving as an alumni advisor.

"It feels so good to experience the continuing enthusiasm of the club. I am so impressed by the size—it grew so fast! It really gives me a warm feeling to find people who are just as concerned about WPI, its traditions and its future, as we were when we helped revive the Society."

Student support is evident as well. When asked, most respond that they joined mainly because of the variety of activities offered. One student wanted to "get involved in alumni-related events" while others simply knew a friend already involved in SAS who enjoyed it.

Others say they find the activities a refreshing, enjoyable, and valuable experience—one that offers them an opportunity for more—and more worthwhile interchanges with the WPI community.

Kirsten Storm '85 of Gardner, MA, is former editor of Newspeak, *the WPI student newspaper, and an SAS member.*

WPI CLASS NOTES

Dear WPI Graduate:
What's new with you? Let us know and we'll share it with your fellow alumni in the *Journal* class notes.
Thanks!
Stephen Hebert '66, Director of Alumni Relations

. . . . . .

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George P. Strom, '56

1908

Sumner Davis of Lexington, KY, one of the longest-serving Boy Scout leaders in the U.S., celebrated his 100th birthday on Jan. 28. He served as a Scout volunteer for more than 50 years (30 years as Scoutmaster) and also held posts as a merit badge examiner, a committee member of several councils, an executive board member of the Birmingham, AL, council and a chairman of a Sea Scout committee. In 1933, he won the highest Scouting honor an adult can receive, the Silver Beaver Award.

Davis worked at a nitrate plant at Mussel Shoals, AL, during World War I and in the 1920s owned a planing mill at Athens, AL. A former electrical engineer with the Alabama Power Co. in Birmingham, he retired at 65 and later served the company as a consultant. He then became a bookkeeper for his son, Dr. Sumner Danforth Davis, and retired for the second time, at age 90, following his son's death.

1920

Reunion **May 30–June 2, 1985**

Milt Garland, now retired as vice president of engineering, continues as a consultant at Frick Co., Waynesboro, PA. He is internationally recognized as an expert in compressor technology, refrigeration and heat transfer and is regarded throughout the U.S. as "Mr. Refrigeration" by his peers in the industry. A fellow of the American Society of Heating, Refrigeration and Air Conditioning Engineering, he received the society's distinguished service award. The Frick Co. annually awards two Milt Garland College Scholarships to children of employees.

1924

Winfield Gove and his wife, Sylvia, whom he married last August, reside in Belleair, FL.

1925

Reunion **May 30–June 2, 1985**

1926

Hap Wendin writes that life doesn't begin at 40, but at 80! The Wendins' latest project is the Elderhostel program in both Europe and the U.S. They expect to be in Mexico for about a month, then return to the "grindstone of bridge, lapidary interests and Spanish and creative attitude programs," which they serve as leaders.

1929

Arthur Burr serves as a visiting professor in the mechanical engineering department at the University of Texas in Austin.

1930

Reunion **May 30–June 2, 1985**

1933

Vincent Buell is a classmate whose retirement hasn't been a real retirement. A project engineer for Stubbs, Overbeck & Associates of Houston, TX, he retired in 1974 to Parkersburg, WV, only to be recalled to work for another year. Once back in Parkersburg, he represented the city during the construction of a new city hall. He also served as resident inspector on a high-rise building for the elderly. At the conclusion of these projects, he "temporarily" joined his son as bookkeeper in his new sports shop, a job which lasted four years. The Buells, now fully retired and living in the Texas Hill country, recently celebrated their golden wedding anniversary.

Art Dixon writes that he likes the idea of the *Journal's* class notes section. During the past eight years he's undergone surgery for cancer (now considered cured), suffered two strokes leaving one side partially paralyzed, and lost his wife of 42 years to lung cancer. Currently, he lives with his daughter in Golden, CO, but for precautionary reasons goes to a nursing home during weekdays. He keeps busy by operating the nursing home snack shop.

Frank Eaton and his wife, Mary, are spending their retirement in sunny Port St. Lucie, FL, with occasional visits to their four children and five grandchildren in Florida, California and Connecticut. They also plan to visit relatives in Germany. Frank, who attended our 50th reunion, is looking forward to our 55th.

Joseph Fogg, whom many of us recall making winning springboard dives at college, still walks on the beach with his wife every day. He says he's had to cut down on tennis since his knees "won't take it any more." Retired for eight years, he's in good health, and lives at Neptune Beach, FL. The Foggs enjoy visiting their three sons and traveling in and out of the country.

Robert Fulton reports from Portland, ME, that his wife, Ruth, has published a (Coans) family genealogy book, which required four years of research on her part. The book was read by a distant West Coast relative who had valuable documents which could have greatly reduced many hours of Ruth's research had she known of their existence. Bob and Ruth are members of the Mayflower Society.

Al Glenn, whom we often see at Tech Old-Timers meetings in Worcester, says he enjoyed our 50th reunion the most. He lives in Millbury and often speaks on subjects ranging from professional golf tournaments to Pearl Harbor. Although he is now officially a member of the Class of 1934, we hope to see more of him.

Leighton "Bud" Jackson writes that because he attended our 50th, he now sees three of his fellow chemists regularly: **Ray Crawford, Al Laliberte** and **Carl Silverberg.** He usually visits them when he and his wife go through Sturbridge on their way to vacations in New Hampshire or Maine.

Carroll "Mac" Johnson and his wife have sold their Antrim, NH, house and moved into a new retirement community on the site of the Mary Baker Eddy Home in Concord, which is largely populated by women. "I've met one man, so far." He's thinking of starting an investment club and may even go back to teaching school in Concord.

Ed Johnson, retired vice president of Northeast Utilities, still lives in West Hartford, is active in his church and is a long-time member of the Avon Country Club. One of his daughters, Karen, is in Germany with her Army medical officer husband and the other, Sally, is married and living on the south shore in Norwell, MA. Ed often attends TOT meetings at WPI.

Harold Lamlein reports that although he started out as a chemist, like so many of us he ended up in management. After working as laboratory head, plant controller and superintendent, when his plant was acquired by United Technologies, he became technical superintendent. He retired in 1969. The Lamleins, who have an architect son and a botanist daughter, have lived near Toledo, OH, since 1937. Although there are now many new homes around them, they still cut three cords of firewood from their property annually.

After our 50th reunion, **Jack Osborn** and his wife traveled to Victoria and Vancouver, BC, and visited a classmate we haven't heard from recently: **Weldon McFarlane.** The McFarlanes took the Osborns on a tour of Vancouver. Jack adds that back in Phoenix he works part time for his own firm as a manufacturer's representative, sells real estate and plays golf.

Franklin Roberts and his wife, Dee, enjoy their retirement at the Admiralty Club in Port Orange, FL, where they are socially active. Frank says that with the help of several aspirin, he can still complete a round of golf. He plans to look up some of his nearby classmates, including **Roy Driscoll, Harry Clarke** and **Charlie Smith.**

Al Brownlee, Class Secretary

1935

Reunion **May 30-June 2, 1985**

1940

Reunion **May 30-June 2, 1985**

George Bingham, former manager of hydroelectric power and water for Chas. T. Main, is now retired and residing in Lake Oswego, OR. A professional engineer, he is also a consultant.

1941

Andy Anderson is a sales engineer for Manufacturers Supplies Inc., West Boylston, MA.

Albert Bellos continues as vice president of engineering at Sandy Hill Corp., Hudson Falls, NY.

1943

Last June, **Perry Fraser** retired from Mechanical Technology Inc., Latham, NY, where he had been engaged in Stirling engine development for five years. Earlier, he had worked for GE, principally at Knolls Atomic Power Laboratory, Schenectady, NY, where he was involved with nuclear reactor development for submarine propulsion. In retirement, he plans to invent and evaluate in the following areas: solar concentration and high-temperature heat storage and more efficient engines.

1944

Last August, **Calvin Davis** retired from GE as manager of magnet wire engineering and quality control of Motor Magnet Wire Operations in Fort Wayne, IN. He had been with the firm for 36 years. During his last assignment with GE, he made three trips to Japan. Currently, he is manager of technical services for Elektriscola Inc., Penacook, NH. He writes that he thoroughly enjoys his new post. "Also we're glad to be back in New England." The Davises enjoy golf, traveling and genealogy.

Everett Johnson retired in June as manager of the Texaco Research Center, Beacon, NY. He had also been associate director of departmental services. Active with the Boy Scouts, the local Methodist Church and town affairs, he has also been a board member of the Council of Industries of Southeastern New York and of the United Way of Dutchess County. He is a past president of the Dutchess County Health Planning Council and past chairman of the town Republican Party.

1945

Reunion **May 30-June 2, 1985**

Ed Baldwin retired in 1984 from AT&T Technologies after 36 years with Bell Labs, Western Electric and AT&T. He is now enjoying his ham radio and home computer hobbies.

Alfred Green, president of Process Heating Corp. of Westboro, MA, has been named to the Worcester Academy board of trustees.

Paul Kokulis and his wife, Carolyn, have been named "Citizens of the Year" by the Chamber of Commerce in Potomac, MD. For the past 20 years, they have opened up their home to teenagers in the area on Friday nights, with 100 youngsters often in attendance.

1946

Paul Gorman has been elected president and chief executive officer of the C. T. Main Corporation, a Boston-based international engineering and construction firm. Previously, he had served as president, executive vice presi-

1984: At Tassajara Road Race (Danville to Livermore, CA.)

Foxy Grandpa Wins Grand Masters Award

Well, at last it's official! Ed "Foxy Grandpa" Delano, '30, is the Grand Masters cycling champion. Last fall in Denver, CO, he beat Herbert Kimball of Southern California in the national time trials.

Ed is quite modest about his accomplishment. "These things are pretty easy to win for us old guys," he says. "Nobody wants to come out for them."

The real reason there isn't a larger field in his age group (75–79) could be that potential contenders may be intimidated by Ed's remarkable record: five unofficial Grand Masters titles and six Senior Olympics crowns.

On the other hand, Ed's feats have brought dozens of less competitive seniors into cycling. "I feel that cycling is made to order for older people," he says. "Once the elderly see how much healthy fun it is, they want to try it, too. I've gotten lots of publicity and veteran racers say they compete because of me. They don't want me to have *all* the fun!"

Ed, who started cycling on a modest scale in Chicago and on Long Island in the 1920s, pedalled across the U.S. in 1970 to attend his 40th reunion at WPI. Five years later, he celebrated his 70th birthday wheeling from Vacaville, CA, to Quebec, Canada.

"On the Quebec trip, I made my best time ever for that distance," he reports. "3260 miles in 33 ¼ days."

In 1980, he biked to WPI again, this time for his 50th reunion. In 1981, he teamed with five other veteran riders to complete the Senior Citizens (62 or over) Coast-to-Coast Relay. The group traveled from San Diego to Washington, DC, in 9 days and 20 hours, with at least one rider on the road at all times, day and night, rain or shine.

Summing up his favorite hobby, Ed stresses, "Cycling is wonderful for retired people. It's the best aerobic conditioner there is. It's good for the cardiovascular system. And it's wonderful training, even though I suffer all the way!"

dent and manager of Chas. T. Main Inc., the corporation's engineering and design subsidiary. Before joining Main in 1975, he was vice president and general manager of the Boston office of United Engineers & Constructors Inc. He received an MSME from Northeastern University, where he later served on the faculty of the Graduate School of Engineering.

1949

Donald Taylor, president and chief operating officer of Rexnord since 1978, has been named vice chairman and CEO of the firm. He was employed by Nordberg Manufacturing Company prior to its merger with Rexnord in 1970. In 1973, he became president of Nordberg and a vice president of operations for Rexnord. He graduated from the Advanced Management Program at Harvard University.

1950

Reunion **May 30-June 2, 1985**

Richard Olson, P.E., of Shrewsbury, MA, has been elected president of the Worcester Engineering Society. He is a senior member of the American Society for Quality Control (ASQC), an associate member of the European Organization for Quality Control and past chairman of the Worcester section of ASQC. Nationally, he serves as vice chairman for division affairs for the Inspection Division of ASQC. Olson, who holds an MBA from Northeastern, has his own consulting practice in quality control. Since 1971, he has been an adjunct professor of management at the University of Lowell. In 1983, he was named senior lecturer by the university in recognition of his long, distinguished teaching service.

Robert Smith is now with Alco Electronic Products Inc., North Andover, MA.

Stanley Tokarz, who retired in 1982 as chief of engineering service at the Veterans Administration hospital, Bedford, MA, currently serves as a part-time building inspector in West Boylston, MA. "I was getting bored with retirement," he says. In 1970, he retired as a lieutenant colonel from the U.S. Air Force after 29 years of combined active and reserve duty.

Robert Van Amburgh holds the post of development manager at C.R. Bard Inc., Moncks Corner, SC.

1951

Andrew Freeland works for Harris Corp., Leesville, SC.

1953

John Morrill, who is retired from BF Goodrich Chemical, now resides in Newport, NC.

In October, **Richard Samolis** was appointed to the State of Massachusetts Apprenticeship Council. The council comprises three members of management and three members of labor, with skills and interests pertinent to apprentice training. Samolis is a senior consultant in the energy management services department of Northeast Utilities, where he has been employed since 1957. He is a registered professional engineer in Massachusetts.

1954

Donald Ross has been elected a member of the board of directors of Troy Mills Inc. in New Hampshire. He is president of MPB Corporation of Keene, a division of Signal Corporation.

1955

Reunion **May 30-June 2, 1985**

Gerald Backlund is manager of plant operations at American Cyanamid Company, Stamford, CT.

Brian Kelly, vice president–operations, Bell of Pennsylvania and vice president–staff operations, Diamond State Telephone, has been named group president–information products and services, Bell Atlantic Enterprises. He will be responsible for information equipment sales and maintenance and service markets, including those of Bell Atlanticom Systems Inc., Telecommunications Specialists Inc., and Sorbus Service.

1956

Charlie Healy and his wife, Louise, have relocated to Manila in the Philippines from Sydney, Australia. Currently, Charlie is with international business development for the Asia/Pacific region for Ebasco and expects to do a lot of traveling in that part of the world. He sends his best to his WPI classmates.

The Rev. **Paul Schoonmaker** is pastor of Calvary Baptist Church, Providence, RI.

1958

William Hopf is vice president and general manager at Cooper Industries, Oklahoma City, OK.

Robert Jacobson serves as an advisory academic specialist at IBM in Hamden, CT.

Robert Jenkins, a senior materials engineer for Law Engineering Testing Company, wrote "Nondestructive Testing—An Evaluation Tool," which appeared in the February issue of *Concrete International*. He belongs to ACI Committee 228, Nondestructive Testing of Concrete. Law Engineering provides consulting engineering services in the fields of geotechnical and construction materials.

Joel Korelitz is president of Standard Engineering Corp., Fremont, CA.

H. O. Painter continues as vice president of marketing at GenRad Inc., Phoenix, AZ.

1960

Reunion **May 30-June 2, 1985**

Martin Beck was recently elected a vice president of the Massachusetts Federation of Planning Boards. A member of the Pepperell (MA) planning board since 1978 and its former chairman, Beck has been a regional director of the federation for the past four years. He had been vice president of the Massachusetts Association of Regional Planning Agencies since 1981. The governor's appointee to the state Hazardous Waste Advisory Committee, he is past chairman, Northern Middlesex Area Commission.

Ivan Kirsch's first grandchild, Caitlyn Danielle Kirsch, was born Nov. 15, 1984.

1962

Dr. John Tien was co-author of "The U.S. Superalloys Industry—Status and Outlook," which appeared in the September issue of *Journal of Metals*. Currently, he is the Howe Chair Professor of Metallurgy and director of the Center for Strategic Materials, Columbia University, New York City. He has 22 years of experience in the science and technology of superalloys. In the past decade, he has been advisor for many major jet engine, rocket engine and gas turbine projects and has been involved in research planning and implementation of most of the advanced superalloy developments. Besides WPI, he holds degrees from Carnegie-Mellon and Yale. He is a member of the National Materials Advisory Board Committees dealing with aerospace structural materials, as well as a consultant to the UN and a member of the Metallurgical Society of AIME.

1963

Donald Chaffee is a self-employed engineering consultant located in Park City, UT. He has a PhD from UCLA.

Al Molinari, president of Data Translation, Marlboro, MA, has been elected to the board of directors of Shawmut Worcester County Bank.

1964

MARRIED: Peter Dornemann and Ellen Terryberry in Cummaquid, MA, on November 17, 1984. Ellen, placement director at Red Acre Hearing Dog Center in Stow, MA, graduated from Boston University. Peter graduated from Wharton School of Finance and is director of marketing at Belloframe Corp., Burlington, MA.

Robert Bennett serves as manager of roll grinder engineering at Farrel, Ansonia, CT.

Bill Dowd, who recently left Del Monte and Heublein, has joined Campbell Soup Company as executive vice president in the Mrs. Paul's subsidiary. Mrs. Paul's is a free-standing company that produces and markets frozen seafoods. Previously, Bill was vice president of strategic planning and operations for Del Monte in Farmington, CT.

Howard Hill owns and operates Datamarine International Inc., in Pocasset, MA, a firm which makes and sells electronic devices for pleasure boats of all sizes. The devices tell the small-boat owner or yachtsman the depth of the water, speed, direction and exact location, and by prearrangement it will take him/her to his destination, even if it is hundreds or thousands of miles away. Not only does the firm sell oceanographic instruments, but it also has developed flowmeters with digital readouts to accurately measure pipe flow for industrial use. Before founding Datamarine more than 11 years ago, Hill had worked on marine instrumentation as a chief engineer and on computers and digital devices for IBM and Honeywell.

William Lechman serves as president of Fairfield Mfg. Co. Inc., Lafayette, IN.

Richard Lundgren recently became chairman of the mathematics department at the University of Colorado at Denver.

Bruce Reynolds now works as a representative for Mutual of Omaha, Shrewsbury, MA.

Richard Ryczek has been named director of research and development of Niagara Mohawk Power Corp. With the firm since 1964, he was formerly manager of nuclear engineering. A licensed professional engineer, he has a master's in industrial administration from Union College, Schenectady, NY.

1965

Reunion **May 30-June 2, 1985**

Gene Dionne, who has an MBA from Auburn University, continues as a lieutenant colonel in the USAF. The Dionnes have one child and reside in Littleton, CO.

Donald Franklin serves as a computer auditor for the U.S.-Saudi Arabian Joint Commission on Economic Cooperation, Department of the Treasury, Washington, DC. He is currently in Saudi Arabia.

George Lemmon has been appointed president of Ebasco Plant Services Inc., New York City. Previously, he served as the New York office manager of engineering. In his new post, he will also serve as chief operating officer of the Ebasco subsidiary which provides startup, operational and retrofit services for electric generating stations and industrial plants. With Ebasco since graduation, Lemmon has held positions of increasing responsibility, including chief engineer of instrumentation and control. A registered professional engineer in 11 states, he belongs to the IEEE.

1966

James Loomis serves as resident manager for Stone & Webster in Boston.

1967

Thomas Kelley, who holds a JD from Suffolk University, is a patent attorney for Monsanto in St. Louis, MO.

Robert Lockwood serves as director of software engineering for Stearns Computer Systems in Minnetonka, MN.

Gary Willis, vice president of the Foxboro Company, has been assigned responsibility for all U.S.-based operations and worldwide support functions of the firm. Formerly general manager of Foxboro analytical operations, he became a vice president in April 1984. He joined the company in 1975 as a major project coordinator.

1968

Kenneth Battle is an engineer associate with Uniroyal in Geismar, LA.

Victor Calabretta, Jr., has been named director of operations for CE Maguire Inc., Providence, RI. He is a corporate vice president and director of port and marine operations for the international architects, engineers and planners. Since joining the firm 13 years ago, Calabretta has progressed through a number of assignments, including supervising design and related work on domestic and international marine and port facilities. He assisted in activating the CE Honolulu regional office and was project engineer for a large ammunition depot on Guam. Prior to joining CE, he served with the Civil Engineer Corps, U.S. Navy.

Gerald Cronin is manager of electric product design for Worcester Controls, West Boylston, MA. He has received a patent for a valve actuator-controller.

Dr. Jerry Jasinski, who holds a master's degree from WPI, was the author of the article, "A Small-College Undergraduate Program in Industrial Chemistry," which appeared in a recent issue of the *Journal of Chemical Education*. He is associate professor of chemistry at Keene (NH) State College.

Scott Ramsay has been elected to the board of trustees of the New Hampshire Symphony Orchestra (NHSO), which he has served as a development committee member for the past year. He is vice president and general manager of the central division of Shaw's Supermarkets Inc.

1969

George Banks received the Mystic (CT) Chamber of Commerce's 25th annual Commu-

Joe Marcus Retires as UMass Engineering Dean

When 200 friends gathered to honor Joe Marcus '44 at his retirement party in December, it was a given that colleagues from the University of Massachusetts would be there *en force*. A witty, well-liked administrator and teacher and, for a number of years, the associate dean of engineering, Marcus was leaving the Amherst campus following 36 years of service.

Joining in the special tribute were representatives with WPI connections, including George Marston '30, Don Berth '57 and Ken Scott '48. Said Marston, the first dean of the School of Engineering (1947–1963), "In the early years after the School opened, all the faculty pitched in. Although Joe was a chemical engineer, he taught civil and mechanical engineering, too. We soon learned he was a capable administrator and student adviser, as well."

Berth, vice president of University Relations at WPI, added, "You could call Joe a utility ballplayer in the very best sense. He played every position for which he 'was volunteered' or 'volunteered' with enthusiasm, commitment and competence. While his retirement will directly impact upon engineering at the university, the engineering universe beyond Amherst will also miss his lively presence."

Joe received both the Metawampe Award from the students and the Distinguished Teaching Award in the 1960s. In 1975, he received the Engineering Alumni Award from the university. Last year, he won the Chancellor's Medal for "exemplary and extraordinary service."

Marcus (left) and UMass Dean of Engineering James John

As associate dean of the School of Engineering, Marcus took a prominent role in expanding undergraduate opportunities, including the women's engineering program. He instituted projects that involved high schools and community colleges, thus ensuring greater cooperation between the university and these institutions, and was instrumental in establishing the Smith College-UMass Dual Degree Program in Engineering.

Prof. Ken Scott of the ME department at WPI had this to say of Marcus, "Joe is a professional who has dedicated his life to advancing engineering education. He has provided a continuity while at the same time encouraging change and innovation."

nity Service Award in January. At 37, he is one of the youngest recipients of the award. He has been involved with the Mystic Babe Ruth League since 1967, serving as league president since 1978. Also, he is president of the Stonington Recreational Basketball League and treasurer of the Mystic Community Center's board of directors. Active with the local Boy Scout post, he is associated with the Noank Men's Bowling Team, as well. He is a computer programmer with the Vitro Corp., New London, CT.

Joseph FitzGerald holds the post of senior mechanical engineer at Gulf States Utilities, Beaumont, TX.

James Heinrich serves as district manager at Elliott Co., Orinda, CA.

Dave Johnson has accepted the position of sales manager of software systems for AT&T International in the Pacific Basin. He and his wife, Jan, will be in Tokyo for two years.

Barry Shiffrin was recently promoted to advisory engineer at IBM in Endicott, NY. His work involves acting as a consultant for the usage of the IBM personal computer for engineering and administrative users. IBM has published one of his programs for the IBM personal computer. Entitled "DOS File Tracker," it is part of the "Directory for Personally Developed Software." The directory may be ordered free by calling (800) IBM-PCSW (426-7279).

Dr. **B. Lee Tuttle,** associate professor of mechanical engineering at GMI Engineering & Management Institute, Flint, MI, has been named the recipient of the 1983-84 Charles L. Tutt, Jr., Innovative Teaching Award. The award recognizes GMI faculty members who have made significant improvements in the educational process of the institute. Lee was selected because of his sustained record of innovation and creativity in the teaching of manufacturing processes at GMI. The author of several publications, Lee holds a master's and PhD from Pennsylvania State University. He belongs to various professional societies and has received numerous awards.

1970

Reunion **September 28, 1985**

MARRIED: Edmund Curtis to Dr. Sharon Anderson on September 22, 1984, in Cambridge, MA. She graduated from the University of Arkansas. Her residency was at the University of Oregon, and she is affiliated with Brigham and Woman's Hospital, Boston, and the Harvard Medical School. He manages the Curtis Construction Company in Cambridge, MA.

Gregory Barnhart is national sales manager for Inmos Corp., Colorado Springs, CO.

Daniel Czernicki continues as engineering manager of Naval Underwater Systems Center, Newport, RI.

Philip Warren, who joined Nashua Corp., Watervliet, NY, in 1973, has been named manager of manufacturing for the company.

1971

MARRIED: Douglas Keily to Kathryn Stone in Simsbury, CT, on November 10, 1984. She is a graduate of the University of New Haven and is employed as a branch personnel manager at DEC, Meriden, CT. He holds the post of project manager at Combustion Engineering in Windsor, CT. . . .**Francis Wehner, Jr.,** and Denise Marleau on November 3, 1984, in Auburn, MA. Denise, a proofreader, graduated from Worcester State College. Francis works for General Dynamics–Electric Boat Division, Groton, CT.

Carlton Cruff is supervisor of forging development at Pratt & Whitney Aircraft, East Hartford, CT.

Dave Demers of Demers Associates also serves as a regional correspondent for the magazine *Fire Command*, which is published in Quincy, MA. He is a consulting fire protection engineer, as well as a captain in the Lunenburg, MA, fire department. Recently, he received a master's in fire protection engineering from WPI.

John Meschisen has been appointed distribution superintendent at Eastern Edison's Fall River, MA, division. Previously, he was director of purchasing and material control with EUA Service Corp. He joined the EUA system in 1975.

Michael Winn was recently appointed to manufacturing manager in the preliminary department at R.R. Donnelley & Sons' Old Saybrook, CT, division. He began work at the firm in 1977 as an industrial engineer. Until his recent promotion he held supervisory posts in the preliminary department, in building and maintenance and in the pressroom.

1972

Dr. **Howard Levine** is employed as senior scientist at Polaroid Corp. in Cambridge, MA.

Brennan McLaughlin was a co-author of "Maintaining Condensate/Steam Quality," which appeared in the October issue of *Power Engineering*. A supervising process engineer

with United Engineers & Constructors, he is responsible for developing systems to comply with environmental permits and other process work related to flue gas cleaning and water/waste treatment.

John Woodward, formerly a captain with the Marine Corps, was recently promoted to major. Previously, he had been a commanding officer for the Communications Support Co., Battalion Headquarters, 27th Marine Regiment. He holds a master's in systems management from the University of Southern California. His medals include the Navy Achievement, Sea Service Deployment and National Defense. He and his wife, Nancy, will be stationed in Okinawa for a year.

1973

BORN: to Susan and **Robert Akie** a son, Thomas Edward, on October 24, 1984. WPI relatives include: Prof. **Roy Bourgault '42** of the WPI ME Department, grandfather; **Richard Bourgault '78,** uncle; **George George '41,** great uncle; and **Douglas George '69,** cousin.

Maj. **Richard Brontoli** is currently on a one-year tour of duty as the area engineer in El Salvador for the Army Corps of Engineers. He is responsible for three military construction projects.

James Davis is a salesman for Dearborn Chemical, Lake Zurich, IL.

Terrence Luddy serves as a special agent for the FBI in Fairmont, WV.

Martin Sklar is a project engineer for Johnson & Johnson, Braintree, MA. The Sklars, parents of a new daughter, Jennifer, reside in Needham, MA.

Robert Wood, head of Werner Pump Co. of Cincinnati, OH, discussed his experiences as a member of the mechanical side of a racing team at the Indianapolis 500, before the Uxbridge (MA) Rotary Club in December.

Instructing lab assistants at Lehigh

"Physics for Poets?"

"This is an exciting time for the physics department at Lehigh University," says physics professor Shelden Radin '58, who has been with Lehigh for 21 years. Currently, the department is planning an addition to its building, as well as an expansion of the staff.

"We're bringing in new ideas, new research, new courses and, hopefully, more students," Radin adds. "The department is at a critical stage."

Back in 1963, when Radin joined the

1974

MARRIED: Hugh McAdam III to Theresa McCafferty on October 27, 1984, in Merrimack, NH. Theresa, an industry marketing manager at DEC in Merrimack, graduated from Babson College, Wellesley, MA. Hugh holds an MBA from Babson and is a vice president with International Paper Box and Machine Co., Nashua, NH. . . .**Richard Miles** and Joanne Ramey in Lawrence, MA, on November 18, 1984. Joanne graduated from Boston College and is a special needs teacher for the town of Wilmington, MA. Richard serves as manager of systems support at GCA, Bedford, MA.

Alden Bianchi has been appointed an associate at the law firm of Mirick, O'Connell, DeMallie & Lougee in Worcester. A specialist in estate planning and employee benefits law, Bianchi was associated with the Worcester firm of Gilbert and Kenny prior to accepting his present post. He has also practiced law in Chicago and Washington, DC. Besides WPI, he graduated from Suffolk University Law School and Georgetown University Law School.

David Castelli is a senior product engineer for Texas Instruments, Attleboro, MA.

Magician-actor **Steve Dacri** guest-starred with Jennifer O'Neill on TV in "Cover Up" on December 29, 1984.

Gene DeJackome, chairman of the board of selectmen in Orange, MA, resigned his post in March. The six-year board veteran cited "increased business pressures" as one of the reasons for his resignation. He was the youngest town selectman elected when he first ran in 1978 at the age of 26. DeJackome, manufacturing supervisor for Monsanto, Springfield, MA, has also served on the town planning board and as chief negotiator for the personnel board. He belongs to the Kiwanis Club and is a past president of the local Knights of Columbus.

Mark Whitney was recently promoted to senior engineer at Northeast Utilities (NU) in Connecticut. He will be responsible for the nuclear operations department budget preparation as well as the preparation of variance reports and data that the department submits to rate case proceedings. He joined NU in 1979 as an associate engineer in the cost and schedule control branch of the generation projects department. In 1980, he was promoted to engineer in the cost and schedule branch of the nuclear engineering and operations group. Later, he became project manager of the generation mechanical engineering branch of nuclear engineering and operations. A registered professional engineer, he belongs to the ASME and holds an MBA from UConn.

1975

Reunion **September 28, 1985**

MARRIED: Richard Harabedian and Elizabeth Weldon in Fairfield, CT, on November 10, 1984. A systems analyst, Elizabeth graduated from Providence College and is currently pursuing her MBA in computer science at the University of New Haven. Richard is a construction coordinator in Sikorsky's plant engineering department, while Elizabeth is employed in the company's resource planning department. . . . **Ron Materniak** and Joyce Monson in Newark, DE, on November 17, 1984. Joyce holds a BS in textile science from the University of Nebraska and an MS and a PhD in textiles and polymer science from Clemson University. She is a research chemist with Du Pont, where Ron serves as a senior specialist engineer. He has an MBA from the University of

faculty, his initial impression was that Lehigh was downright conservative. The university was just beginning to turn coeducational and the administration did most of the decision making.

"Today, Lehigh is much more open," he says. "There is increasing dialogue between administrators and faculty members. Also, both students and faculty help make campus decisions."

Radin, who received his graduate degrees from Yale, started at Lehigh as an assistant professor. He found the physics department to be "friendly and conscientious about carrying out teaching responsibilities and research," an attitude that prevails to this day. However, since 1963 there have been changes, with Radin making a number of contributions. In 1970, he initiated *Physics 42*, better known on campus as "Physics for Poets."

"I felt we should have people from the Arts College get an introduction to how a scientist thinks," he explains.

Currently, he is supervisor of the freshman physics lab, teaches senior courses in mechanics and modern optics, is responsible for the undergraduate physics curriculum, and is the department's graduate student advisor.

Active with campus committees, including the Educational Policy Committee and the Research Council, Radin also enjoys photographing nature. As a writer, he coauthored the textbook, *Physics for Scientists and Engineers*, which is used in the introductory physics course at Lehigh and other colleges.

Richmond. . . . **Paul O'Brien** to Laurie DePietro in Quincy, MA. She graduated from BU and is a dental assistant. Paul, who has an MBA from the University of New Haven, holds the post of sales manager at Cyborg Corp.

MARRIED: Paul Romanowicz and Electra Lamen on October 6, 1984, in Irondequoit, NY. Electra graduated from Syracuse University. Both she and Paul are employed at Kodak. . . . **Charles Shippee** and Anne Miliotis in York, ME. Anne graduated from Northeastern University's Bouve School of Physical Therapy and is chief therapist for the Physical Therapy Clinic of North Shore, Inc., Lowell, MA. Charles is self employed. . . . **Mark Swain** to Mary Douglas in Amherst, MA, on October 13, 1984. Mary, a graduate of Tufts University, is a financial assistant at Fogg Art Museum, Harvard University. Mark is an engineering manager with Boston Systems Office. . . . **James Sweeney** and Karen Anderson in Bournedale, MA, on September 15, 1984. Karen graduated from Cazenovia (NY) College and works at Colonial Federal Savings Bank in East Wareham, MA. Sweeney is employed in the family business, Playland Arcade in Buzzard's Bay, and by Newell Snow Surveying.

BORN: to Meryl and **Bob Fried** a son, David, on August 23, 1984. For the past two years, Bob has had the post of senior product engineer in the discrete semiconductor division of General Instrument Corp. As part of his duties, he has traveled to Taiwan three times, as well as to Japan and a number of locations in the U.S. Recently, he received the company's quarterly "Employee Performance Award."

Paul Houlihan continues in sales at LSI Logic Corp., Westport, CT.

David Samara is now a senior applications engineer with Westinghouse Hittman Nuclear in Columbia, MD.

Donald Tata has been promoted to vice president of the water management group in Anderson-Nichols' Environmental Division in Clinton, MA. He will have overall managerial and marketing responsibilities for the newly established group.

Michael White was a co-author of "Spinodal Cu-Ni-Sn Alloys for Electronic Applications," which appeared in the November issue of *Journal of Metals*. He serves as a research metallurgist, metal strip research, MPM Division, Pfizer Inc., Wallingford, CT. His current interests center around structure-property-processing relationships of spinodal alloys and the chemical nature of electronic contact surfaces. Prior to joining Pfizer in 1982, he had been with Wyman-Gordon Company and Norton Company. He holds an MS in metallurgy from MIT.

1976

MARRIED: Gary Mezynski and Rosemary McBride in Wakefield, MA. Rosemary attended Nova Scotia College of Art and Design and Vesper George School of Art in Boston. She works for MIT Lincoln Laboratory in Lexington, where Gary is also employed. Besides WPI, Gary attended Johns Hopkins University. . . . **James Roberge** to Christine Cafarelli in Schenectady, NY, on November 4, 1984. She graduated from Maria College, Albany, NY. He has a master's degree from URI, Kingston, RI, and works in the gas turbine department at GE in Schenectady, NY.

Daniel Brock, who has served as fire captain with the Southboro, MA, fire department since 1982, is also an instructor with the Massachusetts Firefighting Academy. He holds a degree in fire science from Quinsigamond Community College.

Ross Greenberg, who received his MD from SUNY Buffalo in 1983, resides in South Setauket, NY.

Madeleine Gauthier Lowe is employed by Aerotronic, Contoocook, NH.

Phil McNamara is president of Power Services Inc., San Clemente, CA.

Ken Scott lives in Groton, CT, where he is employed at the Electric Boat Division of General Dynamics. He was recently promoted to engineering supervisor of the seawater systems group, marine engineering department. Ken enjoys sailing and is active in ASME, serving this year as chairman of the local section.

Steven Tuckerman has been appointed as town planner in Coventry, CT. He had been East Hampton's planner. He holds a master's degree in planning from UMass.

Dr. **Edward Whittaker** continues as assistant professor of physics at Stevens Institute of Technology, Hoboken, NJ. He has conducted research at the Los Alamos Scientific Laboratory, the Argonne National Laboratory and the Rutherford Laboratory in England, as well. The author of numerous technical publications, he has research interests in the application of high sensitivity laser techniques to various types of pure and applied physics problems. He holds master's degrees and a PhD in physics from Columbia University.

1977

MARRIED: Jeffrey Baumer to Elizabeth Lovejoy on November 17, 1984, in Springvale, ME. She attended the University of Southern Maine. He is a manufacturing engineer for Pratt & Whitney Aircraft, South Berwick, ME. . . . **John Dyer,** an alderman for the City of Milford, CT, and Joanne Foster in Poughkeepsie, NY, on October 13, 1984. Joanne, a medical secretary, graduated from Becker and John, who is with Vitramon Corp., Monroe, CT, holds an MSIE and MBA from the University of New Haven. . . . **Michael Siegfriedt** and Michele Mandeville in Winchester, MA, on October 21, 1984. Michele graduated from Salem State College and is an RN at Massachusetts General Hospital in Boston. Michael serves as the manufacturing systems manager of TRW Fasteners Division in Cambridge.

Mike Abrams recently received his MSEE from the University of Houston. Currently, he's working for Input/Output Inc., a small seismic data acquisition instrumentation manufacturer. His interests include spectral analysis and time varying filtering and noise reduction techniques. Also, he's teaching a course at the University of Houston, the first networks course for electrical engineers. He writes, "It's a different experience being on the other side of the desk!"

Last year, **Fred Baker** received an MS in electronics from Oregon Graduate Center. He is now starting his dissertation research for a PhD in applied physics. His topic will be crystal growth and properties of gallium arsenide.

Annette Bodley, PhD, has accepted a postdoctoral research fellowship in molecular biology and biochemistry at Johns Hopkins University School of Medicine, Baltimore, MD, where she will be concerned with cancer research. Last June, she defended her thesis, a study of "The Mechanism of the Calcium Magnesium ATPase," examining how the enzyme operates thermodynamically in allowing muscles to relax.

Bill Cunningham, who works for Data General in Cincinnati, OH, is well remembered at Dartmouth's Amos Tuck School of Business. As a student at Tuck in 1982, he designed a T-shirt with the slogan, "Amos Truck—Learn to Drive the Big Rig," which earned him $3000 in sales. Through the entrepreneurship of a current Tuck student, the T-shirt is now making its second appearance.

Arthur Hyde holds the position of chief planning analyst at Ford Motor Co., Dearborn, MI.

1978

MARRIED: William Alexander and Pamela Simendinger on October 13, 1984, in Brook-

Soto, MA. Pamela, an advertising assistant at Norton Automotive Industries, Framingham, graduated from Colby-Sawyer College, New London, NH. Alexander, who is in the master's program at WPI, is also an engineering supervisor at Cincinnati Millacron Co., Worcester. . . . **Ronald Fish** to Donna Merliss on June 17, 1984, in Meriden, CT. Donna received an AS from Middlesex Community College and graduated from ANI School of Nursing as a licensed practical nurse. Ron recently joined Sanders Associates, Merrimack, NH, in the area of technical marketing. **Lawrence Hindle** and Ellen Mahoney in Groton, CT, on October 27, 1984. A special education teacher at Ledyard High School, Ellen graduated from Southern Connecticut State University in New Haven. Hindle, who has been working for Electric Boat, also attends URI.

BORN: to Bitzy and **David Wilson** a daughter, Melanie Kathleen, on September 28, 1984. David is currently a production manager at BASF Systems, Bedford, MA.

Christopher James is now a senior air quality engineer for the state of Rhode Island's Air & Hazardous Materials Division in Providence.

Pete Mulvihill is a fire protection engineer for Aerojet-General Corporation, a subsidiary of General Tire and Rubber Company, at their Sacramento, CA, facility. He had been with Industrial Risk Insurers for more than six years, most recently as resident engineer in Salt Lake City, UT.

Dr. **Martha Sullivan** has joined Dr. Mark DiBona in the practice of family dentistry in Exeter, NH. She graduated from Case Western Reserve School of Dentistry and completed her residency at Cleveland Metropolitan General Hospital.

Roger Yelle has received his doctorate in physics from the University of Wisconsin in Madison, where he earned his master's degree in 1980. He worked at the plasma physics laboratory at Princeton University for two years before returning to Wisconsin to complete his doctorate. Currently, he is doing postdoctoral work in physics at the University of Arizona in Tucson. He and his wife, Ann Marie, have three children, Kathy, 5; Jeffrey, 3; and Jennifer, 1.

1979

MARRIED: James Grant to Lynn Ridgeway in Manchester, NH, on September 15, 1984. She graduated from Mohonasen High School and is an administrative clerk for GE. He holds degrees from WPI and RPI and is principal engineer with R.E.M. Technologies Inc. . . . **Stephen Laskowski** and Darlene Lauria in East Boston, MA. Darlene graduated from Bridgewater State College. Steve serves as a project superintendent at Westcott Construction Co. . . . **Stephen Olson** and Carol Flint in Promontory, UT, on September 29, 1984. Carol graduated from Bear River High School. They are both employed with Morton Thiokol in Promontory.

Timothy Simoes and **Joan McNamara** '80 in Auburn, MA, on September 16, 1984. Joan works for Monsanto Co., Springfield, and is in the master's program at Western New England College. Tim, who is in the master's program at RPI, holds the post of senior experimental engineer at Hamilton Standard in Windsor Locks, CT. . . . **Johann Thalheim IV** and Sarah Richards on December 22, 1984, in Peapack, NJ. Sarah graduated from Mount Vernon College. . . . **John Zych** and Janice Parrillo in Providence, RI, on October 28, 1984. Janice graduated from BU. John, who has an MBA from Babson, is with Amperex Electronic Corp., Slatersville, RI.

Raul Batschauer, who has an MBA from the University of Chicago, serves as a financial associate at RCA in New York City.

Mary Ellen Shea Caro is employed as program manager at Naval Ordnance Station, Indian Head, MD.

Cynthia Karlic holds the post of associate licensing engineer at Northeast Utilities in Hartford, CT.

Capt. **Brian Kelley** has received his MSEE from the Air Force Institute of Technology, Wright-Patterson AFB, OH.

David Mauriello works as a senior product engineer for Mostek Corp. in Carrollton, TX.

Last year, **J. Paul Spinn** was named as a risk analyst at Exxon Insurance Services Ltd., in Bermuda, his "home." Previously, he and his wife had resided in Palm Beach Gardens, FL, where he was an engineer for Pratt & Whitney Aircraft.

Chris Wilmot is project manager for Naval Ordnance Station, Indian Head, MD.

1980

Reunion **September 28, 1985**

MARRIED: Michael Mitchell and Lisa Montebianchi in Haverhill, MA. She graduated from Emerson College and is a speech-language pathologist for Ashland (MA) Public Schools. He serves as a senior chemical engineer for Texas Instruments, Attleboro, MA. . . . **Mark Nestor** to Susan Bradwin in Avon, MA. Susan graduated from Salem State College and is an RN at Salem (MA) Hospital. Mark works for GE in Lynn. . . . **Casey Cordon** and Patricia Smercuk in Irvington, NY, on September 22, 1984. Patricia, a systems analyst for Du Pont in Wilmington, DE, graduated from Bucknell University. Casey, who had been a senior chemist for Hercules in Wilmington, is now a technical representative for the firm's telemarketing group. . . . **Louis Travaglione** and Analisa Sanchez in Santa Clara, CA, on November 17, 1984. Analisa graduated from the University of Santa Clara and is a major-account manager for Inmac's computer supplies branch in Sunnyvale, CA. Louis, who is in the second year of graduate school pursuing his MSEE, serves as a research engineer for Lockheed Missiles and Space Co., Sunnyvale. . . .

"Now, in the second law of thermodynamics . . ."

William Williams and Ann Messier in Oxford, MA, on August 5, 1984. Ann attended Fitchburg State College and is a teacher. Williams, a data communications analyst at State Mutual in Worcester, is studying for his master's degree at WPI.

Hildegard Benneck, who has been traveling and studying Scientology for eight months, now has a new job with U.S. Telephone in Dallas, TX.

Brian Biernacki has taken a new post as product marketing engineer for the eastern half of the U.S. with Semiconductor Circuits, Windham, NH.

James Drumm is a process engineer for Texas Instruments in Dallas.

Oliver Edwards, now on a leave of absence from his post at Exxon Research and Engineering, is attending Carnegie-Mellon University, Pittsburgh, where he's pursuing a master's in applied mathematics. He writes, "I feel my work experience is helping me gain more from graduate study than I would have gotten if I had enrolled as soon as I had my BS."

John Grasso has been named vice president of manufacturing of Genigraphics Corporation, Liverpool, NY. Formerly, he was director of manufacturing.

Paul Normand serves as a senior project engineer at Fairchild Control Systems in Manhattan Beach, CA.

Rosemary Murphy O'Brien, who recently received her MS in chemical engineering from Tufts, is a process engineer for Badger Engineers Inc., Cambridge, MA.

Pete Schoonmaker works for Northern Research & Engineering Co., Woburn, MA.

1981

MARRIED: Christopher Brandon to JoAnn Berry on September 8, 1984, in Ogunquit, ME. JoAnn graduated from BU and is employed by Cablevision of Boston. Christopher works for Vanasse/Hangen Associates of Boston. . . . **Cynthia Canistro** and Kenneth Martin in Lancaster, MA, on September 8, 1984. Cynthia is a material planner at DEC in Nashua, NH. Kenneth, a graduate of Northeast Institute, Boston, is an industrial drafter at Sanders Associates, Nashua. . . . **David Dombrowski** to Nancy James of Somerville, MA, on October 13, 1984. Nancy has worked as a senior secretary at MIT. David serves as a program manager for GE (AEBG) in Evendale, OH. He is involved with introducing automation and new technology into the production of aircraft engines. . . . **Dale Raczynski** and Donna Blackstone in Wakefield, MA, on October 27, 1984. A teacher at Boston School for the Deaf in Randolph, Donna graduated from Anna Maria College, Paxton. Dale is a chemical engineer at Thibault and Associates in Providence, RI. . . . **Lisa Reis** and Ross Cash in Stoneham, MA, on September 2, 1984. Lisa is a production supervisor for Eastman Kodak Co. Ross graduated from Alfred State College and is a manufacturing engineer at Kodak.

Timothy Daley is employed as a general field engineer at Dresser Atlas in Graham, TX.

Jeffrey Dick works as an applications engineer for Photon Kinetics, Beaverton, OR.

Timothy Gottlieb, no longer associated with Gottlieb & Smith, Consulting Engineers, has been named a public health engineer with the Orange County Health Department in Goshen, NY.

Rick Greene holds the post of management science analyst with Stop & Shop Co. Inc., Quincy, MA. He is studying for his MBA at Babson.

Peter Hinckley works as a product engineer for the Torrington Company, Torrington, CT.

Susan Hoffma continues at Moshi Technical School, Tanzania, East Africa.

Lt. **Frederick Rook** has graduated from the U.S. Air Force communications system officer course at Keesler AFB, MS. He is with the 6940th Electronic Security Wing at Fort George G. Meade, MD.

Rick Rykosky was recently promoted to plant safety director at Gatx Terminals Corporation, New Orleans, LA. The firm is a bulk liquid storage terminal located on the Mississippi River. Rick does project engineering work, which includes design and facilities management. He is also studying for his MBA at Loyola University in New Orleans.

Mark SanAngelo is a project engineer with Briar Contracting Corp., Peekskill, NY.

Gary Winer has received a Juris Doctor degree, *cum laude*, from New England School of Law in Boston. The president of the law school's International Law Society, he represented the school in the Jessup International Law moot court competition. He intends to practice law in Massachusetts.

1982

MARRIED: Kevin Nute to Deborah Duston on November 3, 1984, in Nashua, NH. Deborah graduated from Castle Junior College and is attending Rivier College. She and Kevin are both employed at Sanders Associates. . . . **Michael Pacek** and Elizabeth Watters in Auburn, MA, on November 3, 1984. An RN at the University of Massachusetts Medical Center, Worcester, Elizabeth is a graduate of St. Joseph's College, West Hartford, CT. . . . **Douglas Sieber** and Margaret Fisher of Carlisle, MA, on May 5, 1984. Margaret is an accounts manager for Micro-Temps Inc., Needham, MA. Douglas continues with Haartz Auto Fabric Co., Acton, MA. . . . **Robert Tomaskow** and Clara Montana on November 10, 1984, in Housatonic, MA. Clara is a student at Fisher Junior College. Robert serves as a product assurance engineer with Raytheon Service Co., Andover, MA.

Fred Berbig is a project engineer with Ward Engineering Associates, Springfield, MA. He has his MSCE from WPI.

Patricia Corriveau serves as a scientific programmar analyst with Pratt & Whitney Aircraft, East Hartford, CT.

Gregory Doyle continues with the Federal Highway Administration in Washington, DC.

Rene Fontaine was recently promoted to engineer at Codex Corp., Mansfield, MA, and has purchased a house in Cumberland, RI.

Stefan Hagopian is starting his second year at the University of New England College of Osteopathic Medicine (UNECOM) in Biddeford, ME. UNECOM is the only medical school in Maine and the only osteopathic medical school in New England.

Stephen LeViness continues studying for his PhD in chemical engineering at Rice University in Houston, TX. He has an MS from WPI.

1983

MARRIED: John Atkinson and **Sheryl Hess** on October 27, 1984, in Toms River, NJ. Sheryl is with Sikorksy Aircraft, Stratford, CT, while John is employed by Arthur Andersen in Hartford. . . . **Joseph Capua** to Ellen Morgan in Woburn, MA. Ellen graduated from Melrose Beauty Academy and serves as an account representative with Martini Insurance Agency, Woburn. Joseph works for Raytheon Company. . . . **Patrick Crowley** and Margaret McCarthy in Yarmouthport, MA, on September 29, 1984. Margaret, a Simmons College graduate, is an office manager for PMC Development, Patrick's real estate development firm. . . . **Neil Dubois** to Cheryl Blanchard in Acushnet on November 10, 1984. Cheryl, who graduated from Bridgewater State College and Northwestern University, is a speech pathologist for Sargent Rehabilitation Center, Providence, RI. Neil works for Naval Underwater Systems Center, New London, CT. He is also enrolled in the master's program at UConn. . . . **Scott Fortier** and Suzanne LeClair in Weston, MA, on June 30, 1984. Suzanne, a graduate of Regis College, is employed by Syscon Corporation, New London, CT. Scott works for Naval Underwater Systems Center, New London.

MARRIED: Ensign **Eric Lantz,** U.S.N, and **Renee Vaillancourt, '84,** in Groton, MA, on September 2, 1984. Renee, previously employed by DEC and GE, will be appearing in a new movie, "Legend," slated to be released this spring. Eric is a U.S. Navy pilot. Both Renee and Eric are trained in music, dance and choreography and have performed in theatre. . . .

Mark Majcher and Diane LaJeunesse in Worcester on October 6, 1984. Diane, office manager at MBS, Inc., graduated from Quinsigamond Community College. Mark serves as chief analytical engineer at NTS/Action Division. . . . **Peter Marino** and Mary McCarthy in Hingham, MA. Mary graduated from Forsyth School for Dental Hygienists. Peter works as a sales engineer at M.A. Olson Co. . . . **Donald Soubie** and Mary Beth Barlow on September 1, 1984, in Jarrettsville, MD. She graduated from North Hartford High School and works at Aberdeen Proving Ground, MD, where Donald is also employed.

Alan Carpenter has been named a full-time civil engineer for the town of Plainfield, CT. Previously, he was a civil engineering assistant in the Los Angeles County Road Department.

Daniel Cernese is now a software engineer with DEC, Andover, MA.

Stephen Cobb works as a structural engineer at General Dynamics-Electric Boat, Groton, CT, as well as for Steve Cobb & Sons Inc., Norwell, MA, which he serves as a consultant.

Michael Gagnon works for Westinghouse Electric Corp., Albany, NY.

Stephen Lindquist is employed as a senior engineer with DEC in Maynard, MA.

Elizabeth Paul is working for her PhD in chemistry at MIT, where she is a research assistant.

Mark Robichaud serves as a manufacturing engineer at International Medical Industries, Watertown, MA.

Worcester Telegram & Gazette Inc.

Sotir at Office Center Inc.

"Dr." Sam Sotir: He Births Businesses

When a new business is in the incubation stage, one of the first concerns of the fledgling entrepreneur is often, "What do we do about office space? It's expensive!"

Sam Sotir '72 SIM has a unique prescription for this pre-natal concern of Worcester-area business people: lease office space and full office services from his Office Center in Auburn, MA. "For about a third of the cost of starting your own office in downtown Worcester," Sotir says, "and without the up-front capital expenditure of constructing a headquarters."

Sotir founded Office Center Inc. four years ago after searching for an appropriate start-up company of his own. He felt the office center concept would be a good fit with his background in financial planning and management. A graduate of Clark University, he had previously been chief accountant for the abrasives materials group at Norton Co. From 1974 to 1975, he was the chief financial officer at New England High Carbon Wire Corp., Millbury. In 1978, he founded the Phoenix Management Corp. of Auburn, a financial management consulting company.

Since starting the Office Center, Sotir has helped a number of diverse enterprises to get started with low-cost office space, including Sport International, KDK Fiberoptics, Numen Consulting Associates, Sage Systems Inc., Woulas Associates, Railroad Salvage, King Couriers and Pixelink Inc.

"Besides furnished office space, we offer standard services such as secretarial assistance, telephone answering, copier, Telex, conference room and a mailing address," Sotir explains.

The offices are effectively 500 sq. ft., because of the services supplied in the common areas of the center. "Actually," he says, "we offer services and an environment equivalent to those enjoyed by a Fortune 500 company executive."

The center is growing. It has a new 14-person conference room, with five more offices under construction. "We are considering expansion either into Westboro or downtown Worcester," Sotir reports. Worcester area businesses, it seems, like Sam Sotir's Rx for success.

1984

MARRIED: Shaiq Haq to Dr. Raheela Ali on November 9, 1984, in Pakistan. Shaiq has an MSME from WPI and is a senior engineer at Dr. A. Q. Khan Research Labs in Rawalpindi, Pakistan. . . . **Deborah Harrow** and Charles Mulligan, Jr., in Fort Devens, MA, on October 7, 1984. Deborah serves as a systems engineer at IBM in Savannah, GA. Charles, a graduate of the U.S. Military Academy, is with the U.S. Army Corps of Engineers in Ft. Stewart, GA. . . . **William Holland** and Susan Poirier in Clinton, NY, on June 30, 1984. Susan graduated from UMass and is a computer operator at Kelly Services, Binghamton, NY. Holland works for IBM in Endicott, NY.

MARRIED: David MacAdam and **Mary St. Thomas** in Worcester on November 4, 1984. She graduated from William & Mary College and is a biomedical engineer at Andover Medical Inc., Lowell, MA. David graduated from Holy Cross and is a biomedical engineer at Biorad Ophthalmic Division, Cambridge, MA. Both hold master's degrees from WPI. . . . **Keith MacNeal** and Paula Lamoureux in West Springfield, MA, on September 8, 1984. Paula was formerly assistant director of sales and marketing for Mansfield Paper Company in West Springfield. Keith works for DEC in Northboro. . . . **David Metrano** and **Deena Oriente** on October 7, 1984. Deena holds the post of industrial engineer at Data General in Southboro, MA. . . . **John Pinette** to Heidi Emery in Rowley, MA, on August 19, 1984. Heidi graduated from Triton Regional High School and is a bookkeeper at the First National Bank of Ipswich, MA. John is computer systems manager at Northeastern University.

BORN: to Sharon and **Steve Schoonmaker** their first child, Christina, on June 12, 1984. Christina's grandfather is the Rev. **Paul Schoonmaker '56**. Her uncle is **Pete Schoonmaker '80.**

Mary Ingemi has been employed by Data General.

Stephen Jencks works for Varian Associates/Advanced LPD Division, Lexington, MA.

Barry Joseph is with the Air Force.

Steven Joyce works for Sikorsky Aircraft, Stratford, CT.

Corinne Juneau is now a production control specialist with General Electric, Binghamton, NY.

Jeffrey Junker works for Adams-Smith.

Ken Kadezabek has joined Sikorsky Aircraft. He has an MSME from WPI.

Peter Kaplan is employed at Precision Robots.

Shoshanna Kaplan is with the Foxboro Company.

Marion Keeler has been named an Edison engineer by GE in Pittsfield, MA.

Brian Keogh works for the Oceanic Division of Westinghouse in Annapolis, MD.

Amine Khechfe is currently a sales engineer with the Trane Co., La Crosse, WI.

Gregory Khederian has been named to the staff at RCA.

Robert Kilroy has joined the Marine Corps.

Christopher Kintz has been employed by Balco.

Susan Kirkman is a civil engineer with the Massachusetts Department of Transportation.

James Knittel works for New Media Graphics.

Steven Knopping is studying for his MSME at MIT.

Jeffrey Knox has taken a post with Eastman Kodak Company.

Steven Kochman is with the Navy.

Steven Korb is employed at Research Foundation of New York.

Robert Korkuc has been employed as an Edison engineer by GE in Philadelphia.

Gabor Korthy works for Data General.

David Krafcsik is now with Westinghouse Electric Corp.

Steven Krouse is a graduate student at MIT.

Kurt Krusinski is with AT&T Technologies, Bell Labs. Currently located in California, he is also a graduate student at Stanford University.

Richard Kukucka is an MBA student at the University of Chicago Business School.

Karen Kulik is employed as a field engineer by George B.H. Macomber Co., Boston.

Bradford Kullberg, who holds an MBA from WPI, is employed as a senior engineer at Polaroid in Waltham, MA.

Leonard LaBua has joined the staff at IBM.

Lisa LaChance works for the Barden Corporation, Danbury, CT.

Stephen LaJeunesse has joined Data Translation, Marlboro, MA, as an analog engineer.

Debra Lamontagne is employed by the Gillette Co.

Mark Lanciault has joined Raytheon Company, Bedford, MA, as an associate engineer.

Eric Langevin works for Con Diesel Mobile Equipment Co.

Peter Langfield has been employed by the Foxboro Company.

Susan Langlais has accepted a systems engineering post with Mitre Corporation, Bedford, MA.

Ken Lanier works for LTX Inc.

Christopher Lavallee is a grad student in the department of food engineering at UMass.

Paul Lazecki has joined Norden Systems.

James Lee works at Data General.

Dennis Leonard works for the firearms division of Colt Industries.

Donald Letson is on the staff at Raytheon Company.

Thomas Levergood is now with Digital Equipment Corporation.

Kenneth Lindberg works for Texas Instruments in Dallas.

James Linhares is a second lieutenant in the U.S. Army.

Richard Linnehan has been employed by Raytheon Co., Bedford, MA.

Ronald Lion is a graduate student at the University of Michigan.

Robert Lokuta works for Mitre Corporation.

John Long is with Raytheon.

Lisa Longwell works as an associate software engineer at Compugraphic Corp., Wilmington, MA.

Fernando Lopez de Victoria now works for Lockheed Missiles & Space Co.

Kenneth Lovegreen is currently working for Texas Instruments, Lewisville, TX.

Barbara Mace works for the Foxboro Company.

Nancy Mack has been employed by Polaroid Corporation.

Donald Mackay works for Data Products.

Bruce MacRae has been employed by AT&T Technologies.

Richard Madamba is working for Hamilton Standard.

Vinod Makhijani, who works for Lytron Inc., has an MSME from WPI.

Patrick Makridakis has joined Raytheon Company, Wayland, MA.

Peter Manca is a diagnostic engineer at Data General in Westboro, MA.

Kenneth Mann works for IBM.

Larry Manor has been employed by RCA.

Frank Manter, who holds an MBA from WPI, serves as a senior I&C engineer at Thermo Electron Corp., Waltham, MA.

Albert Marinilli has joined Mitre Corporation, Bedford, MA.

Michael Mario is with Bell Labs. He has an MSEE from WPI.

Kenneth Markoski works for Emhart Corp.

Patricia Martone has joined Hewlett-Packard.

Paul Maselbas works for County of Los Angeles Engineering Recruitment.

Andrew Matthews works for Data General.

Steven Mayer, who has an MBA from WPI, works as an engineering system programmer analyst for GE in Fitchburg, MA. He also is a supervisor for Shaklee nutrition consultants. ("A home business.")

Philip McCarty is on the staff at System Development Corp.

Marie McClintock has accepted a post as software engineer with DEC, Marlboro, MA.

William McConaghy is now with Du Pont.

Elaine McDonald is working for DEC, Marlboro, MA.

John McDonald is a management intern with Consolidated Edison, New York City.

William McDonald has joined Digital Equipment Corporation.

Russell McFatter is now a programmer/analyst for Waldman Eye, Hackensack, NJ.

Michael McIntyre serves as a process engineer (thin films) for Data General in Sunnyvale, CA.

William McLaughlin is with CBS Technology Center.

Stuart McLean has accepted a post with Honeywell Information Systems.

Kelly McNagny is studying for a PhD in molecular biology at the University of Alabama.

Mark Melfi has joined ITT-Telecom.

James Melvin works for DEC, Tewksbury, MA.

Kevin Menice is employed at Intel.

Howard Miller has joined Hughes Aircraft Corp., Long Beach, CA.

Frank Moizio has joined Texas Instruments in Dallas.

David Mongilio has been employed as a process engineer in GE's silicone products division, Waterford, NY.

Donald Montgomery works for DEC.

Todd Moore is now an associate engineer with IBM in Kingston, NY.

Theodore Moran serves as unit manager at Northrop Corp., Norwood, MA. He has an MS in management from WPI.

Lisa Moreau has joined American Management Systems.

James Morin is with Hitchiner Mfg. Co., Inc.

Thomas Morris is employed at MITRE Corporation.

Teresa Moruzzi works for MITRE Corporation, Bedford, MA.

Carl Mosley is with RCA.

James Mothersele works for Hughes Aircraft.

John Mundy has accepted a post as electrical engineer with C&C Associates in Wilmington, MA.

Brian Murray is a junior civil engineer with the Massachusetts Dept. of Public Works, Boston.

Brian Myrick works for Digital Equipment Corporation.

Vinayan Nair, now a graduate student at Georgia Tech in Atlanta, has an MS in chemical engineering from WPI.

Krishnamurthi Narayan has joined the Air Force.

Richard Nasman works as an environmental engineer for Camp Dresser & McKee, Edison, NJ.

Debbie Neff has joined GE.

Nelson Newhouse is with the U.S. Army.

Haidung Nguyen is employed at IBM, Boca Raton, FL.

Jack Nickerson is a graduate student at the University of California, Berkeley.

Robert Norberg serves as a systems engineer for GTE-Government Systems Corp., Needham, MA.

Marty Nowland has accepted a position at Mitre Corporation.

Michael O'Brien has joined the Foxboro Company.

Stephen Offiler works as a design engineer for Texas Instruments, Attleboro, MA.

Janet O'Leary is now at Procter & Gamble, Cincinnati, OH.

Jonathan Olson has accepted the post of construction superintendent at the Henley-Lundgren Co., Shrewsbury, MA.

Steven Opolski is a graduate student at Rutgers University.

Shawn O'Reilly works for Data General.

Ensign **Michael Ortolano** has been assigned duty with the U.S. Department of Energy, Naval Reactors, in Washington, DC.

Robert O'Shea works for Raytheon.

Thomas Palasky is employed as a process engineer at National Semiconductor, Danbury, CT.

David Paquette holds the post of site superintendent at Northover Assoc., Westboro, MA.

Joseph Parisi, Jr., works as a field engineer at DCM Corporation, Framingham, MA.

Karen Patras is a grad student at Tufts University.

Edward Paulsen works for LTX Inc.

Kyle Peacock works for IBM.

Thomas Pecorini is an applications engineer with the Chandler Evans Division (firearms) of Colt Industries, West Hartford, CT.

Joseph Perlik is employed by Tennessee Gas Pipeline in Houston, TX.

Christopher Petersen has joined Raytheon Company.

Diane Peterson works for Hughes Aircraft Co.

Sara Jane Phillips, who has her MSEE from WPI, has accepted a post with AT&T Bell Laboratories, North Andover, MA.

John Pilczak works for Raytheon in Marlboro, MA. He has his MSEE from WPI.

Karl Pilon works for Sikorsky Aircraft.

James Podsiadlo serves as a senior engineer at Data General in Westboro, MA. He and his

wife, Vivian (Hiscock) '83, hold MBAs from WPI.

David Polonsky was recently commissioned a second lieutenant in the U.S. Air Force upon graduation from OTS at Lackland AFB, TX. Currently, he is assigned to Kelly AFB, TX.

Luc Poulin is now with Data General.

James Pouliopoulos works for GE.

Sherman Power is on the staff of Texas Instruments in Dallas.

Evan Pressman is with the Naval Electronics Command.

Richard Priestley is with General Dynamics Electric Boat Division.

Michael Prince is studying at the University of California at Berkeley.

Timothy Proch has joined the staff at IBM.

Michelle Provencal is now a systems programmer/analyst with Pratt & Whitney Aircraft, East Hartford, CT.

Andrew Racicot works as a project engineer for Data General, Southboro, MA.

Ronald Rappel is studying for his MSEE at RPI.

Joseph Ratte has joined GE in St. Louis, MO, as a technical marketing trainee.

David Wnuck has joined Coppus Engineering, Worcester, as a sales engineer.

Craig Wolpert is employed as a programmer at Computervision, Bedford, MA.

Darrell Wong works for Reed Rolled Thread & Die Co., a division of Litton Industries.

Douglas Wood works for Data General.

W. Minot Wood is a grad student in the civil engineering department at WPI.

Mitchell Wright has been employed by Honeywell Information Systems.

Frank Zanghi has joined General Dynamics as a career development foreman. He is located at the Quonset Point facility in North Kingstown, RI.

Jay Zavada is on the staff of Westinghouse Electric Corp.

School of Industrial Management

Robert S. Schedin '43, SIM '57 of East Brookfield, MA, was awarded the Albert J. Schwieger Award for outstanding achievement during SIM's 36th annual mid-year banquet, held in January at the Pleasant Valley Country Club. Schedin is president and chief executive officer of Fairlawn Hospital Inc., Worcester. He was associated with the Crompton and Knowles Corporation of Worcester for a number of years before accepting his current position in 1972. Schedin has been a trustee of Becker Junior College and the United Way of Central Massachusetts. A past president of the Massachusetts Coalition of Community Hospitals, he has been a member of the boards of directors of the Central Massachusetts chapter of the American Red Cross and of Home Federal Savings Bank. He is a member of the Finance Committee in East Brookfield.

Jack Shields '69 has been named to the board of trustees of Clark University in Worcester. He is vice president and group manager for sales and service worldwide for Digital Equipment Corp. Also, he is co-chairman of DEC's marketing sales committee and a member of its management and strategy committees. Responsible for the firm's sales and customer service organizations, including field and educational services, he is also involved with the government market segment and international operations. Jack joined Digital in 1961 and was promoted to vice president in 1981. He attended Harvard Business School. . . . **Carl Swanson '70** was recently appointed vice president of quality assurance at Fenwal Incorporated, Ashland, MA. Since joining the firm in 1968, he has held several engineering posts, including manager of protection systems engineering and manager of production engineering. He was director of quality assurance prior to his latest appointment. . . . **Edwin Larson '77** serves as general sales manager of Union Metal Corp., Canton, OH.

Natural Science Program

MARRIED: Joan Morse '70 and Harold Comeau in Peabody, MA. Joan graduated from Salem State College and is a teacher in Peabody. Comeau graduated from the GE Apprentice Program and served in the U.S. Air Force. He is an accountant with GE.

Arthur Clement '70 is a physics teacher at Hopkinton High School in Contoocook, NH. . . . **Judith Doherty '78** teaches in the Norwell (MA) School System. . . . **Nancy Degon '84** is a teacher in the Auburn (MA) Public Schools. . . . **Francis Halas '84** serves as chairman of the science department at Malden Catholic High School, Malden, MA.

COMPLETED CAREERS

A. Hugh Reid '11, a retired sales engineer, died in Worcester on December 21, 1984, at the age of 95. A native of Worcester, he graduated as a mechanical engineer.

Mr. Reid, the former head of the Coburn Trolley Track Division of Wickwire Spencer Steel Co., Spencer, MA, had also been employed at Ludlow Mfg. Assoc. and Colorado Fuel & Iron Corp. as a sales engineer. He retired in 1958. He belonged to Sigma Xi. His son, Douglas, is a member of the Class of 1941.

Howard F. Wright '12 of Bristol, CT, passed away on May 18, 1984. He was born on Dec. 31, 1885, and graduated with a BSEE.

Also a licensed civil engineer and surveyor, he had worked for the Bristol engineering-surveying firm of Sperry & Buell. For many years before retiring, he was with the New Departure-Hyatt Division of General Motors. He belonged to Theta Chi and the Masons, and he was an amateur radio operator.

William R. Stults '13 of Macon, GA, passed away in January. He was born on August 26, 1889, in Charlotte, MI. He received a BSME from WPI.

Prior to becoming a senior partner with W. Kenyon Drake Associates (architectural engineers) in Jacksonville, FL, Mr. Stults had served as an architect with two other Florida firms and had been associated with Chase Turbine Mfg. Co., Orange, MA. He retired as an architectural engineer in 1957.

He was a member of the Florida Engineering Society, the National Society of Professional Engineers and the Baptist Church. Also, he had served as vice president of the Jacksonville Building Code Advisory Board.

Leslie J. Chaffee '16, president of the former Chaffee Brothers Co., died on Nov. 2, 1984, in Tacoma, WA. He was 91.

After receiving his BSME, he joined the family company, Chaffee Brothers Co., in Oxford, MA. The firm, founded in the late 1800s, grew to be the largest manufacturing company in Oxford after World War II. The company was closed in 1961 when Mr. Chaffee moved to Tacoma.

The oldest member of the Oxford United Methodist Church, Mr. Chaffee was also a past commander of the local American Legion post and a member of the Oxford Board of Assessors, as well as a member of a number of school building committees. He was a World War I veteran and belonged to SAE. He was the father of **Gordon Chaffee '42.**

Hubert H. Frary '16, a retired woodturner, died November 25, 1984, in Hyannis, MA. He was born on March 5, 1895, in Charlemont, MA. He studied mechanical engineering at WPI.

After working in the wood-turning business for 10 years, he moved to Worcester in 1930 and was employed by the Loring Manufacturing Co. In 1935, he and his brother, George, began their own wood-turning business in Wilton, ME, which they operated until 1970.

Mr. Frary was an Army veteran of World War I. He belonged to the Masons, the American Legion and Lambda Chi Alpha.

C. Leory Storms '16 of Roselle, NJ, passed away on September 18, 1984, after a short illness. He was 90 and a native of Norwich, CT.

Following his graduation as a civil engineer, he joined Western Union Telegraph Co., New York City, where he was employed until his retirement as senior field engineer in 1960. He belonged to Phi Gamma Delta, Tau Beta Pi, the Scottish Rite Masons and the board of trustees of the Roselle Free Public Library, which he served as president.

William H. Green '17 of Beaufort, NC, a former toy manufacturer, died October 5, 1984. He was born on November 30, 1894, in Framingham, MA.

While still a student at WPI, he joined the U.S. Army Infantry in France during World War I. Upon the death of his father, he became owner of the former Whitney-Reed Co., Leominster, MA. Several of the firm's wooden hobby horses are in antique toy collections in museums across the country. A member of Theta Chi, Mr. Green was also active with the Rotary, the Masons and the Veterans of Foreign Wars.

Robert C. Hanckel '17, a retired engineer who worked on the early design of the Distant Early

Warning (DEW) Lines, a surveillance system in northern Canada, died in Brockton, MA, on November 30, 1984. He was 90, a native of Costa Rica and a graduate civil engineer.

During his career, he was with Technical Advisory Corp., New York City, and helped gather data for preliminary city plans for Worcester, MA. Later he was with S. W. Sawyer & Son, the Philip Carey Co. and then became a member of Fireproof Materials Inc., Albany, NY. Other posts were with the New York State Department of Public Works; Stone & Webster, Boston; the Thompson and Lichtner Co. and Cleverdon Varney & Pike, Boston—as well as a Boston architectural firm and Metcalf & Eddy. He also was a self-employed structural engineer.

A pioneer in the use of pre-stressed reinforced concrete, he helped introduce forward-thinking structural designs to the Boston area. He was the author of several articles and reports in his field and was a professional engineer in a number of states. He belonged to the ASCE, ACI, SPE, the Masons, the American Legion, and the Sons of the American Revolution. He was an Army veteran of World War I and had served as president of the Schenectady chapter of the Alumni Association.

Henry W. Sheldrick '17, a retired chief engineer and treasurer of Collier-Keyworth Co., died in Gardner, MA, on December 30, 1984, at age 90. He was a native of Temple, NH.

Following his graduation from WPI as an electrical engineer, he was employed in the Worcester and Chicago plants of the Washburn Co. He was then with Collier-Keyworth Co. for 42 years, retiring in 1971. During World War II, he was instrumental in designing and manufacturing fire-extinguishing and fire rescue equipment at Walter Kidde Co., and other prime contractors of war supplies.

Active with his local Episcopal Church and with World War I veterans' groups, Mr. Sheldrick also had a long association with the Boy Scouts of America. He served on various committees and had been president of the Monadnock Council, as well as a member of the Camp Collier site committee. At the time of his death, he was one of the oldest living recipients of the BSA Silver Beaver Award, which he received in 1934.

Other awards included the Home Town Builders Award (1971), a citation from Gov. Michael Dukakis (1978), and the Outstanding Citizen Award (1982). He belonged to Tau Beta Pi and had been associated with the American Material Handling Society, the American Ordnance Association, the American Society of Tool and Manufacturing Engineers and the Chamber of Commerce.

George F. Wilkie '18 died October 10, 1984, in Holden, MA, at the age of 88. He was a Worcester native.

Before his retirement in 1961, he was a safety engineer at Pullman Standard Co., Worcester, for 40 years. He was active in the formation of the Worcester chapter of the American Society of Safety Engineers and had served as president of the group. He was a founder and president of the Sterling, MA, Senior Citizens Club.

Mr. Wilkie was affiliated with the Episcopal Church and the Masons. His Alethia Grotto Patrol Drill Team won competitions in the U.S. and Canada.

Philip H. Holbrook '19 died in Gardner, MA, in December. He was born in North Grafton, MA, on March 15, 1895. He studied electrical engineering at WPI.

He was the retired manager of the Shrewsbury Light Co. Earlier he had spent more than 20 years with Massachusetts Electric Co.

Mr. Holbrook, who graduated from Northeastern University, belonged to SPE, the Congregational Church and the Masons. He had held a number of town offices in Ashburnham, MA.

Thomas B. Rutherford '19, a native of Brooklyn, NY, passed away on August 31, 1984. He received his BSEE from WPI.

For many years, he was with the New York State Public Service Commission, from which he was retired. He belonged to Phi Gamma Delta and Tau Beta PI.

Robert A. Peterson, Sr. '20 of Pineland, FL, died last summer. A graduate mechanical engineer, he was born in Worcester on May 14, 1897.

During his career, he was with Morgan Construction Co., Aetna Standard Engineering Co., American Steel & Wire and Carnegie-Illinois Steel Co. He was the owner-president of Hot Mill Consulting Service in Pineland, and he was a member of Phi Sigma Kappa and Tau Beta Pi. In World War I, he served in the U.S. Army.

Albert M. Shaw '20 of St. Petersburg, FL, has passed away. He was born Feb. 18, 1897, in Chicopee, MA, and was a member of the Class of 1920.

He studied mechanical engineering at WPI. From 1920 until his retirement, he was with Worthington Pump & Machine Corp. He belonged to ATO.

Frank K. Brown '21, a retired vice president of Continental Screw Co., New Bedford, MA, died on October 20, 1984. He was born in Leicester, MA, on September 17, 1897.

He earned a BSEE at WPI. In 1926, he joined Continental Screw Co. In 1964, he retired as vice president of manufacturing. He was a member of TOT, the Poly Club and Phi Sigma Kappa, and he was the father of **Marshall Brown '51**.

William J. Harrington '23 died in Woonsocket, RI, on August 5, 1984. He was born on May 22, 1896, in Millville, MA.

After studying chemistry at WPI, he attended Notre Dame University, South Bend, IN. For many years, he worked as a cost analyst for Uniroyal Inc. at plants in Woonsocket and Millville, MA, and in Mishawaka, IN. He was a World War I Army veteran and a member of the American Legion and the AARP.

Simeon C. Leyland '24 of North Caldwell, NJ, died on June 21, 1984. A native of Fall River, MA, he was born on July 8, 1902. He received his BSEE from WPI.

He joined Westinghouse Electric Corp., Newark, NJ, in 1925 and retired in 1967 as general manager of the relay-instrument division. Previously, he had served the firm as a design engineer and product department manager.

A life member of the IEEE, Mr. Leyland also belonged to the New Jersey Society of Professional Engineers, the Masons and Lambda Chi Alpha.

Emerson A. Wiggin '26, a retired school teacher, died in Worcester on October 3, 1984, at the age of 79. He was born in Worcester on January 31, 1905. He received his BSME from WPI.

From 1931 to 1960 he taught mathematics and physics at South High School, Worcester. Other posts included sales engineer for Sullivan Machinery Co., and insurance analyst for Betterley Associates.

Mr. Wiggin was a 50-year member of his local Masonic lodge and a former member of the board of directors of the Worcester County Council on Alcoholism. Active with the Methodist Church, he had served as a lay leader. A World War II Navy veteran, he retired in 1965 as captain after 21 years in the reserves. He belonged to SPE.

Richard S. Converse '28 of Montauk, NY, a longtime employee of Shell Oil Co., died September 23, 1984. He was born on March 15, 1905, in Indian Orchard, MA, and later studied at WPI.

He had been employed by Shell for 28 years, where he served as dispatcher. Following his retirement in 1959, he built and operated a family resort in Montauk, NY. He was a member of Phi Sigma Kappa.

Herbert T. Grimshaw '29 died in Fairfield, CA, on September 14, 1984. He was 76.

For many years, he was with Pratt & Whitney Aircraft, East Hartford, CT, from which he was retired. He belonged to ATO.

Sherman Dane '30, a retired tax accountant, died August 25, 1984, in Weymouth, MA, at the age of 76. He was born in Reading, MA.

During his career, he was with Chamberlain & Co., Hale, Waters & Co. and Rockland-Atlas National Bank of Boston. For many years he was department head at Welch & Forbes, Boston. He belonged to Sigma Phi Epsilon, the Masons and the North Community Church.

John H. Wells '30 died in Ormond Beach, FL, on September 10, 1984, following a short illness. A native of Kennebunk, ME, he was born on February 1, 1910.

After receiving his BSCE, he joined Eastern Bridge Co., Worcester. He was also affiliated with the State of New Hampshire (bridge designer) and Jackson & Moreland Division-United Engineers & Constructors Inc., Boston. In 1975, he retired from Jackson & Moreland as chief engineer. For a number of years he was an instructor in the evening graduate school program at Northeastern.

While with Jackson & Moreland, he was responsible for the structural design of several major projects, including the Central Maine Power Co. Wyman station and the NASA Lunar Landing Research Facility in Virginia.

He was a member of the ASCE (fellow), the American Concrete Institute and Sigma Xi (associate), as well as Sigma Phi Epsilon.

John E. Lampron '30 died in Springfield, MA, on October 13, 1984, at the age of 78. He was a native of Cambridge, MA.

For 25 years he was an industrial engineer at

General Electric Co., Pittsfield, MA. Previously, he was manager of Federal Yeast Corp., Springfield.

Theodore C. Wyman '36 of Cambridge, MA, passed away on June 30, 1984. He was born in Boston on April 2, 1904.

During his career he was with Engineering Service, Woburn, MA, and Massachusetts General Hospital, where he was an architectural draftsman. In World War II, he was with the Naval Reserve.

Dana D. Stratton '38 of Hershey's Mill, West Chester, PA, died of a heart attack aboard the *Queen Elizabeth II* while returning to New York from Bermuda on September 30, 1984. He was 67.

He was born Jan. 20, 1917, in Northboro, MA, and graduated as a mechanical (aeronautical) engineer from WPI in 1938. In 1974, he retired from government service after 35 years in the field of naval aviation. At his retirement he was the director of the Engineering Specifications and Standards Department of the Naval Air Engineering Center at the Philadelphia Naval Base. He was presented with the Meritorious Civilian Service Award and the Navy's Outstanding Services Award.

A member of the Standards Engineers Society, he was also listed in the Federal Roster of Key Scientists and Engineers. During his career with the Navy, he was a member of the Council for Military Aircraft Standards and served as Navy liaison on the National Aerospace Standards Committee. Following his retirement, he served as a consultant for the Navy.

Mr. Stratton, who, with his wife, Rae, enjoyed several WPI alumni trips, belonged to a local golf club, model airplane clubs, the Lions Club, the AARP and the National Association of Retired Federal Employees. He was an avid fisherman, gardener, woodworker, model airplane builder and photographer. His son, Wayne, graduated from WPI in 1975.

Robert A. Morse '39 of Amston, CT, died on May 22, 1984. He was born in Nova Scotia on March 12, 1912.

After receiving his BSME, he joined Pratt & Whitney. Other posts were with Silex Company, Hartford Special Machine and the machine division of Fuller Brush (sales manager). He was active with his local Methodist Church and as a member of Hospitality Lodge.

Max Bialer '40 of Dayton, OH, a retired chief engineer at Wright Patterson AFB, died May 19, 1984. A native of Holyoke, MA, he was born December 17, 1917.

An electrical engineer, he worked for Henry & Wright Mfg. Co., was a radio engineer with the Army Signal Corps during World War II and later held the same post at Wright Field in Dayton. He became chief electronic engineer of the resistor section at the base, then chief of the energy conversion section for the USAF. He belonged to IRE and AEPi.

C. **Harold Stenlund '40** died in North Smithfield, RI, on July 8, 1984. He was 64.

Mr. Stenlund was born Dec. 18, 1919, in Worcester. For 29 years, he was with the Felters Co., Millbury, MA. Also, he had been employed by the American Felt Co., Newburgh, NY, and Rochambeau Worsted Co., Lincoln, RI, where he was an overseer in the dye house at the time of his death.

He belonged to the American Association of Chemists & Colorists and SAE. During World War II, he served with the Marine Corps in the Pacific.

The Rev. **Edward G. Jacober '41** of Kettering, OH, died of a heart attack on August 8, 1984. A native of Newark, NJ, he was born on June 21, 1919. He received a BSME from WPI.

At the time of his death, he and his wife, Virginia, had just come to the states for a year's furlough from Bethlehem, Israel, where they were serving the Christian and Missionary Alliance Arab Church in Jerusalem. They had been missionaries in India from 1951 to 1975, then in Israel from 1975 to 1984. The Rev. Jacober was a member of Phi Sigma Kappa.

Robert J. Sargent '42, the former owner of Germaine Elevator Co., died in Worcester in October. He was born in Worcester on June 18, 1920, and received his BSME from WPI.

Early in his career, he had owned and operated Germaine Elevator. For seven years he was a building maintenance engineer at Worcester State College. He belonged to PKT, ASME, the Lions Club and was a World War II Army Air Corps veteran.

J. Bradford Whitney '73 died November 26, 1984, in Boston. A Worcester native, he was born on August 26, 1951. He had a bachelor's degree in life sciences from WPI.

At the time of his death, he was manager of a chemical plant for A. E. Staley Manufacturing Co. in Van Buren, AR. Previously, he was an R&D engineer for the firm in Decatur, IL. He was a member of Sigma Phi Epsilon.

FEEDBACK

Robert Arnold

Editor:

The article "Why Teach" [November 1984] reminded me of my teachers who were dedicated to opening students' minds. Their only pleasure was in watching the youngsters blossom.

Recently I had the impression that this species of teacher was extinct. Your article has gladdened my heart. I thank God for his small mercies. Long may they live and enrich the traditions of WPI.

S.B. Pattani, '41
Gujarat, India

Editor:

The article in the February 1985 issue titled "The Names Behind the Washburn Story" lacked, I feel, two names. For any student who entered Washburn in search of help, Washburn was Joe Gale and Felix Tozeski. As a student, you never went to Washburn to get help, you went to "see Joe and Phil." The number of students who passed "grunge lab" (ME 1800) with the help of Joe and Felix is uncountable.

The dedication of these two men to teach the art of machining to the students of WPI should not be overlooked. Any student, regardless of discipline, who sought help received it with a smile. Joe and Felix always gave advice and guidance, and the simplest of projects became a learning tool. To ME students of the past, the names behind the Washburn story are those of Joe and Felix. It may be a little late, but thanks, guys!

Richard Ferron '82 ME, '84 MSME
Alliance, Ohio

BOOKS

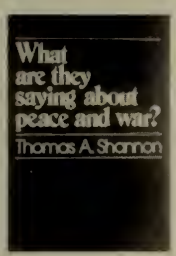
Recently published volumes by WPI faculty.

The Origins of the Federal Republic: Jurisdictional Controversies in the United States, 1775–1787

by Peter S. Onuf
Assistant Professor of Humanities
(Philadelphia: University of Pennsylvania Press, 1983, 284 pages)

Historians have emphasized the founding fathers' statesmanship and vision in the development of a more powerful union under the federal constitution. In *The Origins of the Federal Republic*, Peter Onuf puts the founders' achievement in a different perspective by demonstrating that territorial confrontations among the former colonies played a crucial role in shaping early concepts of statehood and union and provided the true basis of the American federalist system.

Struggles over jurisdiction within and among the American states made the institution of a more effective central government imperative. The book deals extensively with the quest for stable, recognized boundaries in the cases of three states: Pennsylvania, Virginia and New York. Onuf concludes with a description and analysis of the new, expansive conception of union embodied in the federal constitution—an optimistic view that grew out of the successful resolution of jurisdictional disputes.

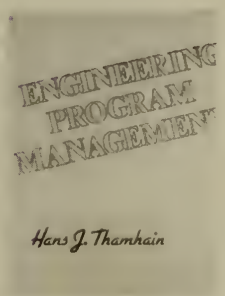


What Are They Saying About Peace and War?

by Thomas A. Shannon
Professor of Religion and Social Ethics, WPI; and Associate Professor of Medical Ethics, University of Massachusetts Medical School
(New York: Paulist Press, 1983, 131 pages)

There is no more burning issue in the churches today than the question of war, nuclear arms, disarmament and peace. *What Are They Saying about Peace and War?* presents a broad analysis of the discussion as it has developed in the Roman Catholic community. The book begins with a survey of the teaching of major world religions and focuses in on the special developments in Catholicism. There are detailed analyses of the works of several American theologians and of recent statements issued by American bishops on the subject. A special treatment is given to the background of the American bishops' pastoral letter on war and peace, which should prove to be a particularly significant statement. Dr. Shannon examines its origin, relation to the tradition, and its contribution to the development of moral teaching on peace and war.

The book will be very helpful for a wide range of readers—religious education programs, discussion groups, college courses—anyone interested in learning about the origins and development of the Just War theory and its contemporary applicability, as well as the new directions in thinking about the morality of war.

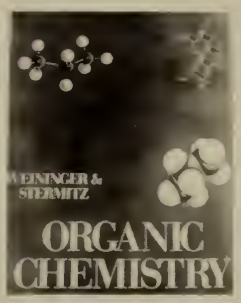


Engineering Program Management

By Hans J. Thamhain
Associate Professor of Management
(New York: John Wiley & Sons, 1984, 350 pages)

This practical guide, the result of 20 years of engineering and project experience, provides today's managers with the latest tools, methods and systems to ensure success in planning, organizing and directing engineering projects. Emphasizing the manager's role as a team builder, *Engineering Program Management* uses current research findings to show managers how to increase their leadership effectiveness; build cohesive, motivated and more productive work teams; and resolve the inevitable conflicts that occur within an organization.

Besides its immediate value as a guide for working project managers, *Engineering Program Management* also serves as a handbook for professional development seminars and as a vital reference for graduate-level studies in engineering and management.



Organic Chemistry

By Stephen J. Weininger
Professor of Chemistry, WPI, and Frank R. Stermitz, Colorado State University
(New York: Academic Press, 1984, 1,121 pages)

Organic Chemistry is a textbook designed to serve students taking a full-year introductory course. It is normally given in the sophomore year, and its principal clients major in chemistry, chemical engineering and the life sciences, and include pre-medical and pre-dental students.

The authors stress an understanding of the three-dimensional structure of molecules as a prelude to understanding their chemistry. Once the structural aspects are firmly grounded, the text discusses organic reactions based on a standard functional group organization. In addition to reactions, it also emphasizes modern analytical techniques, particularly spectroscopic ones.

Organic chemistry is a subject of enormous utility as well as being worthy of study for itself. The text therefore includes many examples of industrial and biological application, which are uniquely developed alongside the fundamentals. Finally, the discussion is enlivened and humanized by highlighting the history, personalities and social impact of organic chemistry.

HERE'S THE LINEUP!

LORA T BRUECK
DUDLEY RD
OXFORD MA 01540

REUNION 1985
May 30–June 2

Thursday evening, May 30
Boston Pops

Friday, May 31
Alumni golf tourney
Alden Labs tour
Campus tours
Institute Day '85—NEW—
- An afternoon of personal growth and development:
  - Motivating people
  - Effective communication
  - Awareness, Communication, Teamwork (ACT)
  - Effective listening

Alumni tennis tournament
Trip to Spags—always an adventure!
Traditional Clambake
Good-Old-Days Get-Together
Hospitality suites

Saturday, June 1
50-Year Associates meeting
Departmental open houses
- CM
- CE
- EE
- ME

Worcester Art Museum visit
WPI Today
Reunion Parade
Worcester bus tour
"Color Me Beautiful"
Calligraphy seminar
Campus tours

Sunday, June 2
Brunch
Campus tours

PLUS

The usual class receptions, dinners and get-togethers

PLAN NOW TO BE ON THE HILL FOR REUNION '85